Arrowpoints, spearheads, and knives of prehistoric times

Thomas Wilson

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ARROWPOINTS, SPEARHEADS, AND KNIVES OF PREHISTORIC TIMES.

BY

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ARROWPOINTS, SPEARHEADS, AND KNIVES OF PREHISTORIC TIMES.

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INTRODUCTION.

A spear is a long, pointed weapon, held in the hand, used in war and hunting, more by thrusting than throwing. Lance is synonymous with spear, though it may be smaller and lighter, but longer, used either by thrusting or throwing. A javelin is shorter, smaller, and lighter than the spear or lance and is better adapted to throwing by the hand. All of them may, in case of need, be used in hand-to-hand combats or in an assaulting column.

A harpoon is a spear or javelin with barbs or toggles, usually thrown at fish or marine animals, though specialized for striking whales.

An arrow is similar to a javelin, but shorter, smaller, lighter, and to be shot from a bow. It is a missile and purely offensive. In prehistoric times and before metals were in use these were tipped with stone or bone.

The arrowpoints, spearheads, and knives of the prehistoric races, when made of stone, have such a likeness of form and style that a sharp line of division between them is impracticable. A small implement may be an arrowhead; a large one of the same type may be a spearhead, while either or both may have served as knives. The distinction might be better made if the shafts or handles remained, but these, together with the lashings and attachments, have decayed and disappeared, except occasionally where bitumen or gum was employed. An implement of this kind, whether large or small, with a light shaft 2 or 3 feet long would be an arrow; the same with a heavy shaft 8 or 10 feet long would be a spear, while either of them with a shaft a foot or less in length would be a knife, dagger, or poniard. Indeed, an implement of the latter class might be accidentally made through the breaking of a spear or arrow shaft. Few if any of these implements of the real prehistoric man have been found with their shafts or handles and lashings or fastenings, and so we are largely driven to theory and analogy for their names and uses. In modern times the perfect arrow, first with a stone head, afterwards with one of iron, and shaft attached, was used in great numbers by the North American Indians; spears complete, with stone or iron head and shaft attached, were used by the Eskimos, and knives with short handles have been found among the Hupa Indians of Oregon and California, and a few in prehistoric graves on the

Mexican border. In Africa, Australia, and Polynesia, the spears and knives are usually of iron, socketed or tanged for the insertion of a handle.

This paper deals principally with the prehistoric arrowpoint and spearhead, beginning with the ruder forms of cutting, piercing, or throwing weapons or implements in the Paleolithic period, and dealing with the subject in all its characteristics. Bows are practically unnoticed, as most specimens from prehistoric times have decayed, but one or two having been found, and these only preserved by being under water or in peat beds.

I. SPEARS AND HARPOONS IN THE PALEOLITHIC PERIOD.

Appearance of the spear in the Mousterien epoch—Appearance of the harpoon in the Solutréen epoch—Spear or harpoon heads with shoulder on one side only.

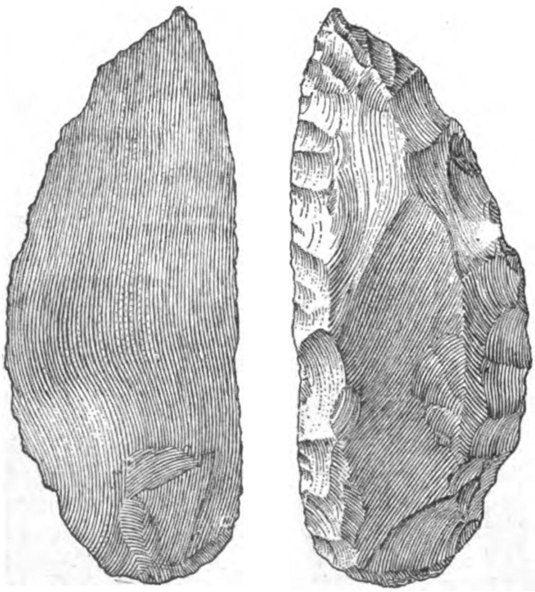
The spear belongs to an earlier epoch in man's civilization than does the arrow. Although they are similar in appearance, they differ greatly in age. The former appeared in the Paleolithic period, while the latter did not appear until the Neolithic.

Fig. 1.
AOHEULÉEN IMPLEMENT OF FLINT.
Side view.
St. Acheul, France.
⅓ natural size.

Fig. 2.
PALEOLITHIC IMPLEMENT OF QUARTZITE.
Madras, India.
Cat. No. 137535, U.S.N.M. ½ natural size.

The first implements known to have been used by man were the rude, thick, heavy, chipped flints which belong to the Chelléen epoch of the

Paleolithic period. They were probably never used with a handle, for it is hard to conceive an implement so ill contrived for attachment to a handle. They are nearly the shape of an almond or peach stone (figs. 1, 2). A portion of the natural crust of the flint pebbles was left at the butt of some of these implements for a grip, thus showing that they were intended to be held in the hand, and not to be handled for use as spears or javelins. These implements are not thin and flat so as to be inserted in a split handle, and whether attempted longitudinally as for a spear, or transversely as for an axe, it would be with difficulty that any of them could either then or now be retained in a handle. If inserted in a wooden handle a sufficient distance to hold, a blow given with force would drive it into and through the wood, and would certainly split the handle. Being insufficiently inserted, it would fly out.



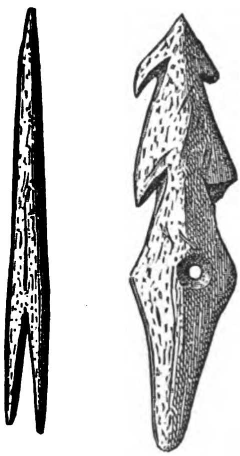
Figs. 3, 4.
MOUSTERIEN SPEARHEAD OF FLINT.
Obverse and reverse.
Le Moustier, France.
Cat. No. 9015, U.S.N.M. Natural size.

We are not driven to theory entirely with regard to this matter, for aside from the fact that some of these are left with the butt of the flint pebble for a grip, the inventive genius of man has not yet been able to discover and employ a handle that could be attached to these or similar implements without being open to one of these objections. Attempts have been made in this direction by several persons, notably in a series in Carnavalet Museum, the municipal museum of Paris. An inspection of this series or of any of the implements themselves will show the impracticability of handling them.

It does not necessarily follow, because these Chelléen implements were not put in a handle and used as spears, that, therefore, the man of that period had no spear, for a sapling or branch of a tree, sharpened and hardened by fire, would have made a most effective weapon of the spear or javelin sort. It may be objected that no such objects have ever been found, yet this is not conclusive against the possibility of the wooden implement having been made, for, being wood, it might have decayed long before the historic period.

In the middle part of the Paleolithic period an implement appeared which we may well suppose to have been the head of a spear or javelin (figs. 3, 4).

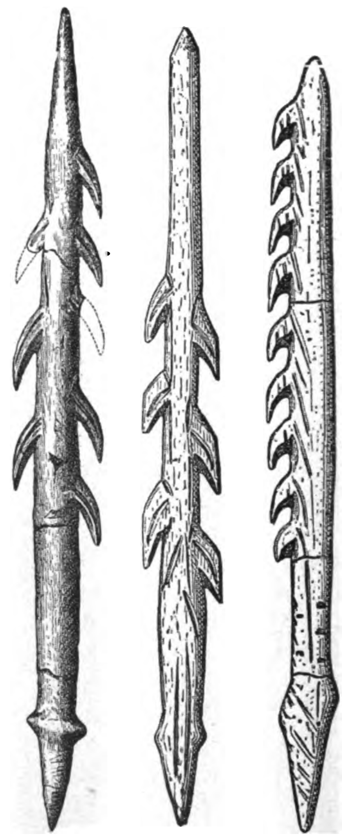
These implements have been called Mousterien points from their having been found in purity and profusion in the cavern of Moustier on the river Vézère in France. Their character is shown by the two figures, being the opposite sides of the same implement, obverse and reverse. They are smooth flakes of flint, thin, rather heavy at the butt, tapering on sides and edges to a point. They were struck from a core of flint at a single blow, which left a broad, flat surface on the inside, showing the conchoid of percussion. The workmen in manufacturing the implement left this side in its original condition as it came from the block. The outer side



Figs. 5, 6.

PALEOLITHIC POINTS AND HARPOONS OF REINDEER HORN.

La Madeleine, France.



Figs. 7-10.

PALEOLITHIC POINTS AND HARPOONS OF REINDEER HORN.

La Madeleine, Dordogne, France.

Lartet and Christy. $\frac{2}{3}$ natural size.

was chipped by small flakes to a regular outline and made sharp along the two edges and at the point. None of the objections made to the handling of the Chelléen implement apply to this. It was and is easy to insert this implement into a cleft stick and fasten it tightly either with thongs or bitumen so as to be effective as a spear or javelin. There is no positive evidence that they were thus used, but the fact that it could have been done, that similar implements were and are thus

used among savages, and that those belonging to the preceding epoch could not have been thus used, establishes a fair presumption in that behalf. This fact being admitted, these represent the earliest spearheads made by man. If these implements were rare, the argument would be correspondingly feeble, but they have been found in great numbers over a large portion of western Europe, and the epoch to which they belonged is believed by M. de Mortillet to have been of greater duration than any other in the Paleolithic period.

In the continuation of the Cavern period to what M. de Mortillet calls the Solutréen epoch, where the inventive genius and the mechanical ability of man became higher, implements are found which establish beyond dispute their use as spears or javelins. True, they have been used as harpoons, but what is a harpoon but a barbed spear or lance? Many of them were of bone or horn. Figs. 5, 6, 7, 8, and 9 are here introduced as typical representations of thousands which have been found in southern France, belonging to this epoch of the Paleolithic period. Those here shown are of reindeer horn and are about natural size. Observe the straight, smooth, tapering points. In one of them (fig. 5) the base is bifurcated to receive the end of a shaft; another has the base brought to a point for insertion into the shaft, and, after the fashion of the Eskimo and other fisher people, it has a hole apparently for the attachment to its shaft by string (fig. 6). The others, larger ones, have at their base an enlargement or swelling, over which the hollow shaft can be forced for a given distance, which, lashed tightly with a thong, will keep it firm, or, inserted but slightly, will allow it to pull out and remain in a wound while the shaft is released (figs. 7–10).

These objects, having belonged to the Paleolithic period entirely disassociated

Fig. 11.

SOLUTRÉEN POINT OF CHIPPED FLINT.

Solutré, France.

Rigny-sur-Arroux (Saone-et-Loire). ⅔ natural size.

with objects of the Neolithic period, constitute satisfactory evidence that man of the Paleolithic period made and used harpoons, and consequently must have been able to make spears and javelins. The difference between the two is more in name than aught else. They are both used in the same way, both serve the same purpose, and with the variation of material and barbs are essentially the same weapon.

These bone and horn harpoons serve to elucidate similar implements of the same period made of flint and to identify them as spears or javelins and not arrows.

Fig. 13.

Fig. 14.

Fig. 12.

SOLUTRÉEN POINTS OF CHIPPED FLINT.

France.

Cast, Cat. No. 99747, U.S.N.M. ⅔ natural size

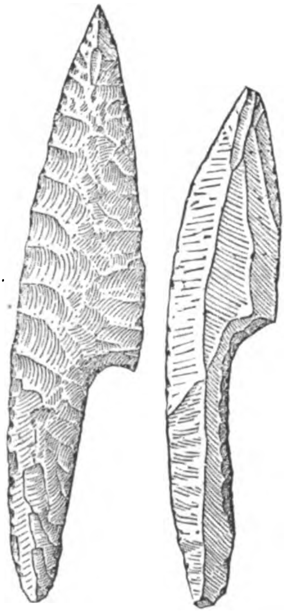
Figs. 11, 12, 13, and 14 show a number of the well-known leaf-shaped implements, called in France *feuille de laurier*, or laurel leaf, from their resemblance to it in shape. This period represents as high a degree of mechanical skill in flint chipping as any other in the world's history.

An examination of these implements is required to understand the delicacy of their manufacture. It required much experience to obtain the needed amount of manual dexterity. One of these leaf-shaped implements, found *en cache* with ten others, is shown in fig. 11. It is one of the largest, being 14 inches long, 3¼ inches broad, and its greatest thickness is less than three-eighths of an inch. The original is in the museum of Chalon-sur-Saône. The implement is made entirely by chipping, the finishing on the edge of which would appear to have been done by pressure and not by strokes. No flint-knapper of the present day, whether amateur or professional, has yet been able to reproduce one of these fine Solutréen leaf-shaped implements. The U. S. National Museum has had many times to contend with fraudulent and spurious specimens which showed considerable manual dexterity, but it has never been presented with counterfeits of these beautiful implements.

They were perfectly adapted for insertion in a handle and could then be used with effect as spears or javelins, according to their size and weight. They might have been taken in the hand and used as knives, the hand being protected by a bit of the skin of an animal or a bunch of grass. They were of all sizes (the figures are two-thirds natural size) and came down from the large one just mentioned, through gradations, to those not more than three-fourths of an inch long and one-half an inch wide. Figs. 15 to 18 show implements of the same

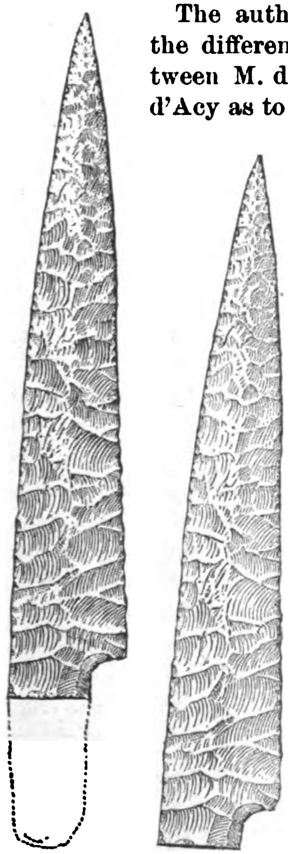
epoch, the shoulder being on one side, contrary to the arrow and spear heads of the Neolithic period, and bearing a great similarity to its brother, the harpoon.

These and similar implements, made of bone and horn, were continued in use throughout the Paleolithic period. So it is proved by deduction and induction that the bow and arrow did not make its appearance during the Paleolithic period, but are later than either the spear or javelin.



Figs. 15, 16.
SOLUTRÉEN POINTS OF CHIPPED FLINT.
Shouldered on one edge. One finished, one unfinished.
Dordogne, France.

The author does not forget the differences of opinion between M. de Mortillet and M. d'Acy as to the various types of Paleolithic implements, and the extinct fauna associated therewith, found in the alluvial gravels of northern France and southern England. He knows also the subdivision called St. Acheuleén, proposed by M. d'Ault Dumesnil, and he does not enter into any of these discussions. His position in this paper does not conflict with either. Whether the Mousterien point was contemporaneous with the Chelléen implement, or was subsequent to it, or how many changes or epochs are represented by the two styles of implements, does not affect the statement that the Chelléen implement probably was not, and the Mousterien probably was, used as a spearhead, and that despite the stemmed and barbed harpoons of the Solutréen or Cavern period, there is no evidence that the bow and arrow was known or used during the Paleolithic period. In this position the author is sustained by one of the highest authorities on the subject in the United States, Prof. Henry W. Haynes, of



Figs. 17, 18.
SOLUTRÉEN FLINT POINTS.
Shouldered on one edge.
Dordogne, France.
Natural size.

Boston, who, as long ago as February 3, 1886, published a paper, the title of which indicates his opinion: The Bow and Arrow Unknown to Paleolithic Man.[1]

II. THE ORIGIN, INVENTION, AND EVOLUTION OF THE BOW AND ARROW.

Origin unknown—A wonderful contrivance—Its mythology—Its history—Arrow release in antiquity.

Of the origin of the bow and arrow, history is silent. We know nothing whatever of its origin from any written word or description in any language or of any people. It is entirely prehistoric. Our only knowledge of its beginning comes from such of the remains of human industry belonging to prehistoric times as have been found in modern times. We can easily base our conclusions on comparisons of these remains. We have seen how the spear and harpoon and possibly the javelin belonged to the Paleolithic period or chipped-stone age; and now we will see how the bow and arrow was an invention of the Neolithic period or polished-stone age. But both these ages lie far back in the past, earlier than any written history, and were unknown to the world until the discoveries of the nineteenth century.

A stick or staff sharpened or hardened by fire might make a spear. Herodotus[2] says, describing the army of Xerxes, that "the Libyans marched clad in leather garments and made use of javelins hardened by fire" (pp. 836, 847). To tip the staff with a bit of flint would be but the first step in the evolution of a better weapon, which, once taken, might continue through all its varieties, from the heaviest and longest spear to the shortest and lightest javelin—from one which was too heavy to carry and was simply to be held up after the fashion of an abattis protecting the holder against an onslaught, down to a lighter and smaller implement which he could hurl at his enemy. All this is in the natural evolution of an invention. One might grow out of the other. We have no positive knowledge that this was the manner of growth, but we may easily surmise it, if not with the Libyans, then with some other and possibly more primitive people.

Hence we can see how the commonly accepted law of evolution and progress may be set at naught by observed facts. The Libyans were noted soldiers and formed part of the greatest army of earth, and one would suppose a priori that their arms would have been of the most approved pattern, but their javelins were the most primitive and rude type, the beginning—really the first step—in warfare; the protoplasm of weapons; the staff sharpened and hardened by fire. So much for spear and javelin.

The bow and arrow is a different weapon, and its invention had no

[1] Proceedings of the Boston Society of Natural History, XXIII, p. 269.
[2] Book VII, 71.

relation with the spear, lance, or javelin. It is a machine, requiring the combined action of two objects. It was the first projectile weapon known to or used by man. The world has accepted the existence of the bow and arrow without much thought of its origin. It belonged to primitive man, and we received it as though part of him. But a moment's consideration of the condition of a savage who had never seen or heard of any machine by which missiles could be thrown farther or harder than he could do it with his hand—that this savage should have invented the spring of the bow, should have utilized it by tightening the cord, and arranged the whole so that by drawing the cord and its sudden release, could project an arrow with such force as to be an effective weapon—that he could do this is a matter of wonder. This invention of the savage is one of the triumphs of mind. It is an illustration of the inventive genius and intellectuality of man. There is but little doubt that it marked an epoch in that dead and gone civilization equal to the discovery in the later years of its complement and successor, gunpowder, and it may have wrought as great a change in man's condition on earth.

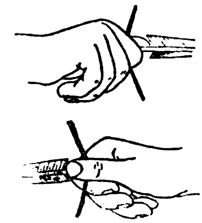


Fig. 19.
PRIMARY ARROW RELEASE.
Prof. E. S. Morse, Bulletin Essex Institute, 1885, XVII, p. 148.

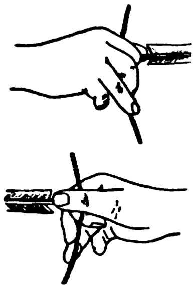


Fig. 20.
SECONDARY ARROW RELEASE.
Prof. E. S. Morse.

In whatever quarter of the globe or among whatever people the bow and arrow has been found, it antedates all our knowledge of it or them as obtained through history. The earliest writers of antiquity mention the bow and arrow as an implement of warfare or the chase as though it was then an old and well-known weapon. Homer, Herodotus, Tacitus, Strabo, and Pliny all mention it. The many references to it in the earlier books of the Bible show it to have been at that time a weapon in common use.

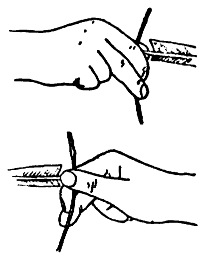


Fig. 21.
TERTIARY ARROW RELEASE.
Prof. E. S. Morse.

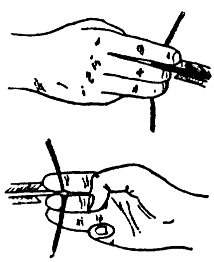


Fig. 22.
MEDITERRANEAN ARROW RELEASE.
Prof. E. S. Morse.

Prof. E. S. Morse, in his study of the different modes of arrow release,[1] (figs. 19, 20, 21, 22, and 23) shows the existence of the bow and arrow in early Egyptian, Assyrian, Etruscan, and Grecian times, from the ancient sculptures and bas-reliefs, although it is only incidental to his subject. If its existence or origin had been in question his illustrations could have been multiplied numberless times from the ancient sculptures, bas-reliefs, painted vases, and coins of antiquity.

[1] Bulletin, Essex Institute, XVII, October to December, 1885, pp. 145–198.

Whether these arrowheads were of stone or metal can not be known from the representations; but the earliest mentioned by historians are of metal.

The bow is represented on the most ancient monuments. In classic art it is an attribute of Apollo, Cupid, Diana, Hercules, and the Centaurs. The form represented was that of the Greek bow—two arcs united by a straight piece in the middle. Grecian mythology attributes the invention of the bow to Scythes, the son of Hercules, or to Perse, the son of Perseus, but Herodotus supposes this to be a tradition of the skill in archery of the Scythians and Persians.

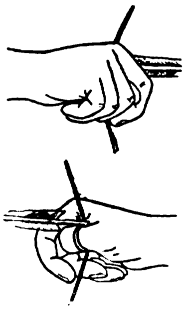


Fig. 23.
MONGOLIAN ARROW RELEASE.
Prof. E. S. Morse.

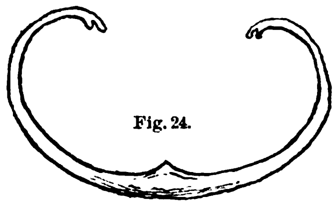


Fig. 24.

Fig. 25.
(Fig. 24) SCYTHIAN AND PARTHIAN BOW.
(Fig. 25) GREEK BOW.
Smith's Dictionary of Greek and Roman Antiquities title Arcus.

Smith, in his Dictionary of Greek and Roman Antiquities, under the title "Demosii," says:

> Another class of public slaves formed the city guard of Athens, * * * they were generally called bowmen * * * or, from the native country of the majority, Scythians.

And again, under the title "Arcus:" "The form of the Scythian and Parthian bow differed from that of the Greeks," and he figures the two (figs. 24, 25).

He continues, saying that Homer has described the Greek bow[1] as made of two pieces of horn, and the bowstring of thongs of leather twisted, but Pandarus's bow was strung with sinew. The bowstring was fastened at one end of the bow, and at the other there hung a hook or ring of metal into which the string was caught when the bow was to be used; when not in use, the bow was unstrung and put in a case of leather, ornamented[2] as shown in fig. 26.

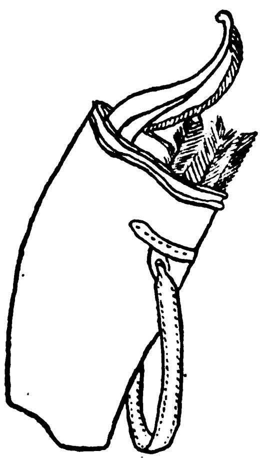


Fig. 26.
GREEK BOW CASE AND QUIVER.
Smith's Dictionary of Greek and Roman Antiquities.

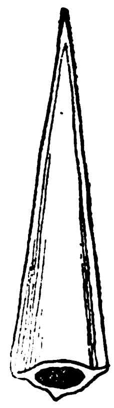


Fig. 27.
GREEK BRONZE "THREE-TONGUED" ARROW-POINT.
Persepolis.

[1] Iliad, Book IV, 105–126.

[2] Odyssey, Book XXI, 54.

The arrowheads were of bronze, Homer says "three-tongued," as shown in fig. 27, and those from Marathon shown further on (fig. 28). The arrow shafts were of light wood or smooth cane, well polished.

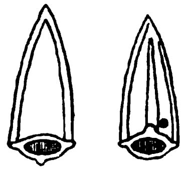


Fig. 28.
GREEK BRONZE "THREE-TONGUED" ARROW-POINTS.
Marathon.
Smith's Dictionary title. Sagitta.

In the Trojan war the spear, lance, or javelin was the principal weapon and used in all three capacities, according to the need. It could naturally be thrown but a short distance in the immediate presence of the enemy, and was sometimes used in hand to hand conflicts.

Homer describes in detail the arms and armor of the Greeks and Trojans and their various uses, and makes apparently no distinction between those of the two peoples.

Achilles, in the combat with Hector:

* * * and, poising, hurled his weighty spear,
But Hector saw and shunned the blow; he stooped,
And o'er his shoulder flew the brass-tipped spear,
And in the ground was fixed: but Pallas drew
The weapon forth, and to Achilles' hand,
All unobserved of Hector, gave it back.

Then Hector:

Poising, hurled his ponderous spear,
Nor missed his aim; full in the midst he struck
Pelides' shield; but, glancing from the shield,
The weapon glided off. Hector was grieved
That thus his spear had bootless left his hand.
He stood aghast; no second spear was nigh:
And loudly on Deiphobus he called
A spear to bring; but he was far away.

Again Hector:

Thus as he spoke, his sharp-edged sword he drew,
Ponderous and vast, suspended at his side;
Collected for the spring and forward dashed. * * *
Achilles' wrath was roused: with fury wild
His soul was filled: before his breast he bore
His well-wrought shield; and fiercely on his brow
Nodded the four-plumed helm, * * *
Gleamed the sharp-pointed lance, which in his right
Achilles poised, on god-like Hector's doom
Intent, and scanning eagerly to see
Where from attack his body least was fenced.
All else the glittering armour guarded well, * * *
One chink appeared, just where the collar bone
The neck and shoulder parts, beside the throat, * * *
There levelled he. [Iliad, XXII, 320.

In the combat with Ajax, Hector:

Poising, hurled his ponderous spear;
The brazen covering of the shield it struck,
The outward fold, the eighth, above the seven

Of tough bull's hide; through six it drove its way
With stubborn force, but in the seventh was stayed.
Then Ajax hurled in turn his ponderous spear,
And struck the circle true of Hector's shield:
Right through the glittering shield the stout spear passed,
And through the well-wrought breastplate drove its way,
And underneath, the linen vest it tore;
But Hector, stooping, shunned the stroke of death.
Withdrawing then their weapons, each on each
They fell. * * *
Then Hector fairly in the center struck
The stubborn shield; yet drove not through the spear;
For the stout brass the blunted point repelled.
But Ajax, with a forward bound, the shield
Of Hector pierced; right through the weapon passed. [Iliad, VII, 273.

The spear shaft was made of ash, and was tough and strong, thus:

The son of Peleus threw
His straight-directed spear; his mark he missed,
But struck the lofty bank, where, deep infixed
To half its length, the Pelian ash remained.
Then from beside his thigh Achilles drew
His trenchant blade, and, furious, onward rushed;
While from the cliff Asteropæus strove
In vain, with stalwart hand, to wrench the spear.
Three times he shook it with impetuous force,
Three times relaxed his grasp; a fourth attempt
He made to bend and break the sturdy shaft. [Iliad, XXI, 192.

Their spears lost or broken, they resorted to their swords:

Then Peneleus and Lycon, hand to hand,
Engaged in combat: both had missed their aim,
And bootless hurled their weapons: then with swords
They met. First Lycon on the crested helm
Dealt a fierce blow; but in his hand the blade
Up to the hilt was shivered. Then the sword
Of Peneleus * * *
* * * deeply in his throat the blade
Was plunged. [Iliad, XVI, 385.

One of the tactical maneuvers of the Greek soldier was to thrust the lance into and through the shield of his opponent, and while he was disengaging it to attack him with the sword.

The swords, shields, and armor are described by Homer, and, as already seen, most of the combats were hand to hand. It is curious to consider that until the invention of the sling and the bow and arrow there was no projectile weapon used in warfare except the lance or javelin. The knights of ancient times, as well as medæival, fought in armor, and whether on foot, on horse, or in a chariot, they pressed the fight hand to hand. It seems curious in these days of long-range guns to think of great wars carried on as prize fighters would, and that beyond arms' length meant out of danger.

Archers could not carry shields, and so were driven to ask protection

of some spear—or swordsman, and this may have had such implication of cowardice or degradation as to account for the rarity of the use of the bow and arrow, for it seems certain that while it was used in the Trojan war it performed but a subordinate part. Paris was an expert archer; Teucer had a bow; Meriones discharges an arrow which strikes Menelaus. "Pandarus the god-like, Lycao's son," was the skilled archer from Crete. His bow, arrow, and quiver are described, and how he was called to act the part of the sharpshooter. Diomedes was dealing destruction among the Greeks when Æneas sought Pandarus—

* * * and addressed him thus:
"Where, Pandarus, are now thy wingéd shafts,
Thy bow, and well-known skill, wherein with thee
Can no man here contend? Nor Lycia boasts
Through all her wide-spread plains a truer aim.
Then raise to Jove thy hands, and with thy shaft
Strike down this chief, whoe'er he be, that thus
Is making fearful havoc in our host!" [Iliad, V, 196.

The bow of Pandarus, with its accompaniments, and the operation of shooting Diomedes, are thus described:

Straight he uncased his polished bow, his spoil
Won from a mountain ibex, which himself,
In ambush lurking, through the breast had shot,
True to his aim, as from behind a crag
He came in sight; prone on the rock he fell,
With horns of sixteen palms his head was crowned.
These deftly wrought a skilful workman's hand,
And polished smooth, and tipped the ends with gold.
He bent, and resting on the ground his bow,
Strung it anew. * * *
His quiver then withdrawing from its case,
With care a shaft he chose, ne'er shot before,
Well-feathered, messenger of pangs and death,
The stinging arrow fitted to the string. * * *
At once the sinew to the notch he drew;
The sinew to his breast and to the bow
The iron head; then when the mighty bow
Was to a circle strained, sharp rang the horn,
And loud the sinew twanged as toward the crowd
With deadly speed the eager arrow sprang—it struck
Just where the golden clasps the belt restrained,
And where the breast-plate, doubled, checked its force.
On the close-fitting belt of curious workmanship
It drove, and through the breastplate richly wrought
And through the coat of mail he wore beneath,
His inmost guard, and best defence to check
The hostile weapon's force; yet onward still
The arrow drove. [Iliad,[1] V. 119.

At the extremity of the plain of Marathon, Greece, is the tumulus mentioned by Pausanias as having been erected over the Athenians

[1] Earl Derby's translation, London, 1867.

killed in that battle, B. C. 490. It was excavated by François Lenormant, and his report was published.[1] A great number of bronze arrowheads were found, short, barbed, socketed, and with three facets.

Flakes of black flint were also found, which were thought by some to have served as arrowheads, but this has been combated and is doubtful. They were all the same type and did not resemble any known standard of arrowhead. They were but fragments of an irregular triangular form, 1¼ to 1½ inches in size, and curved at the point. M. Lenormant is clearly of the opinion that these were not of Greek origin. The black flint is almost unknown in Greece, and he suggests that they might have been used by some of the Persian archers. But even this is doubtful, for we know that bronze and iron arrowheads were used at that period by the Persians as well as by the Greeks. The latter had used them in the days of Homer (figs. 24, 25).

The knowledge of bronze is believed to have come from the East, and if so, would have been known in Persia even before it became known in Greece. It is doubtful if they were arrowheads at all, but if they really were it is much more likely they belonged to the Persian allies than to the Persians themselves. The Scythians and Parthians, coming from the direction of Persia, were the most celebrated archers of the known world, and had bronze, if not iron, arrowheads. History helps us in the view that these stone arrowheads, if they were such, did not come from Persia, nor from the East, but from Ethiopia—the far South.

Herodotus[2] described the arms of the various peoples forming the army of Xerxes. Most of them had the bow and arrow, but stone points were used only by one people.

> The Persians * * * had short spears, long bows and arrows made of cane * * * and under them their quiver hung. * * * The Indians * * * had bows of cane and arrows of cane tipped with iron. * * * The Bactrians had bows of cane, peculiar to their country. * * * The Parthians, Chorasmians, Sogdians, Gandarians, and Dadicæ had the same as the Bactrians. The Caspians, Savangæ, and Pactyes had bows of cane. * * * The Arabians carried at their right sides long bows which bent backward. The Ethiopians carried long bows, not less than four cubits, made from branches of the palm tree, and on them they placed short arrows made of cane; instead of iron, tipped with stone, which was made sharp and of that sort on which they engrave seals. * * * They had javelins tipped with antelope's horn made sharp like a lance.

The Scythians and the rude tribe of Massagetæ used bronze arrowheads in the time of Herodotus, who records[3] how that one Ariantas, a king of the Scythians, took the census of his people by requiring each one to contribute an arrowhead, the whole of which he put in the melting pot and cast into an enormous bronze vessel.[4]

Our modern discoveries point toward bronze and iron having come from the Orient, and getting into Egypt and Ethiopia later than into Assyria or Asia Minor.

Armenia and Caucasus, that vast mountainous and comparatively

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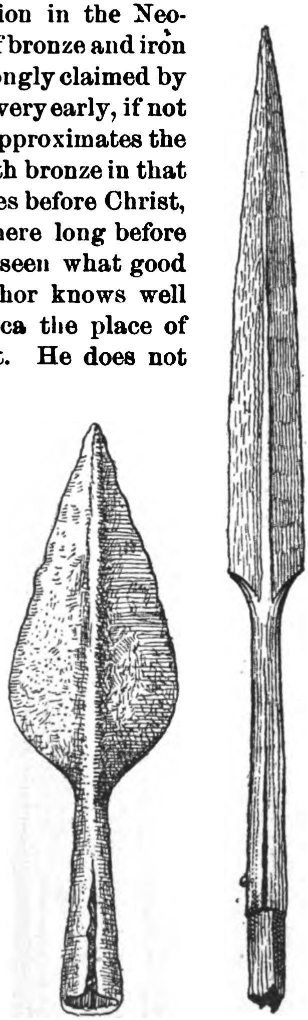
Revue Archæologique, Paris, February, 1867. [2] Book VII, 61-80.
[3] Book IV, 81. [4] Sir John Evans, Ancient Stone Implements, p. 329.

unknown country lying between and to the south of the Black and Caspian Seas, has been lately subjected to critical archæologic researches.[1]

Metals were there early discovered and put to use. But few localities found by the explorers show occupation in the Neolithic period pure and simple. Knowledge of bronze and iron dates to almost the earliest times. It is strongly claimed by de Morgan that Armenia was the seat of a very early, if not the original, discovery of iron. When he approximates the appearance and use of iron in connection with bronze in that country to a period twenty to thirty centuries before Christ, and shows that iron was in common use there long before it was in the adjoining countries, it will be seen what good ground he has for his assertion. The author knows well that M. de Mortillet has assigned to Africa the place of discovery of iron, and this may be correct. He does not argue the proposition; it is aside from his present purpose. He is endeavoring to show the probability that the Ethiopian flint arrowheads in the army of Xerxes came rather from Africa than Asia, and that in the latter country stone as a material for arrow and spear heads had been superseded by metal—bronze and iron.

De Morgan[2] describes swords, poniards, lances, hatchets, bows, and arrows. He says that there were found in the cemetery of Redkine lance heads of both bronze and iron, in the cemetery of Lelwar those of iron only. They were practically the same type, the blade long and narrow in the form of a willow leaf. They all had a projecting rib running longitudinally through the center to strengthen it. They were furnished with a socket in which the shaft was inserted and one or two holes for nails to fasten it. Of course the handle was decayed and lost, but in a few cases remains were found stuck in the socket which enabled them to suppose it had been of ash.



FIGS. 29, 30.

PREHISTORIC IRON SPEARHEADS.

Cemetery of Mouçi-yéri, Russian Armenia.

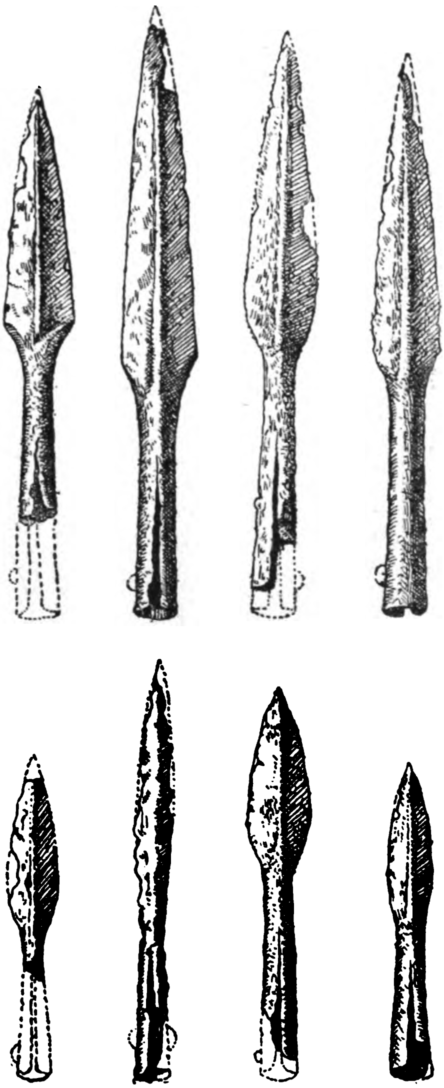
de Morgan, figs. 46, 48.

These iron lance heads varied greatly in size, form, and fashion. Figs. 29 and 30 are from the cemetery of Mouçi-yéri; fig. 29 is 4 inches long and 2½ inches wide; fig. 30 is 25 inches long. The former blade is

[1] E. Chantre, Recherches Anthropologiques dans le Caucase; J. de Morgan, Premiers âges des Metaux dans l'Arménie Russe, Paris, 1889; J. Mourier, L'Archæologie au Caucase, Paris, 1887.

[2] Les premiers âges des Métaux dans l'Arménie Russe, pp. 89–101.

long and narrow, while the latter is short and broad. Figs. 31–38 shows eight of these iron lance heads, all from the cemetery of Cheïtan-thagh.



Figs. 31–38.
PREHISTORIC IRON SPEARHEADS.
Cemetery of Cheïtan-thagh, Russian Armenia.
de Morgan, fig. 47. ½ natural size.

The variations of these spearheads show them to have been the product of individual design and manufacture, and that they were not made by a machine or after a single pattern. They are all socketed; the socket is not solid, but open on the side, showing they were hammered and not cast. The sockets were not welded nor brazed. Whether they could weld or braze two pieces of iron together must be left uncertain. It may, however, be considered certain that they knew of and employed a heat sufficient to weld, and used it in the manufacture of these implements, for without a welding heat they could not make these sharp edges and points. On one of the Egyptian bas-reliefs (at Medinet Abou, Thebes, twentieth dynasty) a Thyrenien warrior is shown with two spears as though one might have been for throwing as a javelin and the other for hand to hand combat.

There was a series of knives of iron from the cemetery of Cheïtan-thagh, Armenia. The handles had been of wood, bone, or horn, fastened much the same as the butcher or carving knife of modern times. Some had a tang inserted in deer horn, some had pieces of bone, others pieces of wood cut thin and laid on both sides, riveted through. The U. S. National Museum possesses a series of the latter obtained direct from M. de Morgan which is represented in the accompanying photographic plate (Plate 1).

The engraving on the bronze belts or cinctures of the warriors show

PREHISTORIC IRON KNIVES AND SPEARHEADS.

Cemetery of Chei'tan-thagh, Russian Armenia.

J. De Morgan, Mission Scientifique au Caucase, I, (Les Premiers Ages des Metaux dans l'Arménie Russe), p. 132, fig. 121.

the form and use of the bow and arrow in that locality at that period. The bow was longer than a man was tall. It was not regular in its form, as are most bows. It consisted of three curves, the center being the smallest and shortest. The drawings (figs. 39, 40) show the form. These forms may have been exaggerated by the ancient artist, but they are our only source of knowledge. From the scenes depicted elsewhere on the cinctures, it is concluded that these bows served for the chase as well as for war.

Chips and flakes of obsidian, few in number and irregular and uncertain in form and from the mountains of Allagheuz, were found by de Morgan, which

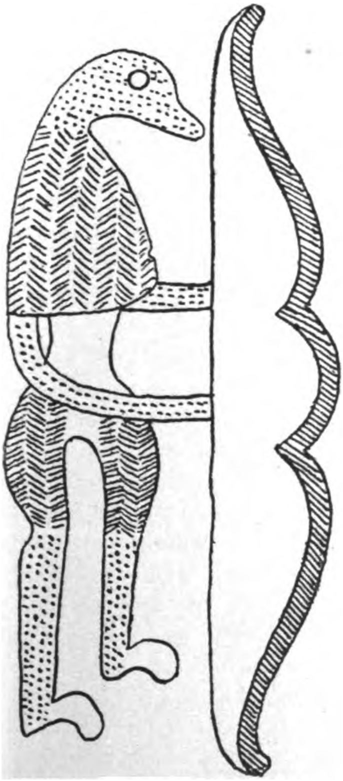


Fig. 39.

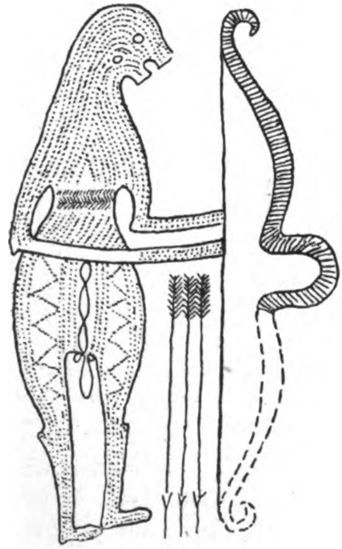


Fig. 40.

PREHISTORIC ARMENIAN BOWS, ENGRAVED ON BRONZE CINCTURES.

Fig. 39—From cemetery of Akthala; fig. 40—from Mouçi-yéri.

de Morgan, figs. 54, 191. Natural size.

he thinks may have been used as arrowheads. The author may be permitted to doubt the generality of such usage—he would not deny isolated or sporadic cases.

The arrowheads found were of bronze or iron (figs. 41–45,) and were of curious forms, some socketed, some stemmed, some with long, fine barbs, others leaf-shaped. Some were arranged with a stem or tang to be inserted in the shaft (figs. 42, 43), others had a socket in which the arrow shaft was to be inserted, and a small hole was provided with a nail or point to fasten it (figs. 41, 44, 45). Some had a curious barb, more the appearance of a nail or spur, springing from the socket, which had

been bent backward into the form of a hook, thus making it into a barb (fig. 41). Some were arranged with barbs, others without. The bronze implements were cast, the iron ones hammered.

A few of the implements of chisel shape, if arrowheads, of the form tranchant transversal, were found in the cemetery of Mouçi-yéri (figs. 46, 47). It is curious to remark that while the bronze and iron arrowheads of this period and locality are the general form of chipped-stone arrowheads of prehistoric times, those of chipped stone—that is, the obsidian specimens—are of a new and almost unknown form, ruder and more archaic than found elsewhere.

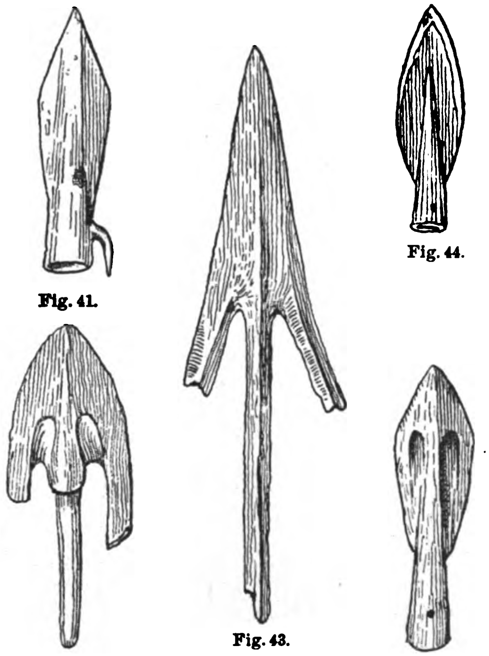


Fig. 41. Fig. 42. Fig. 43. Fig. 44. Fig. 45.

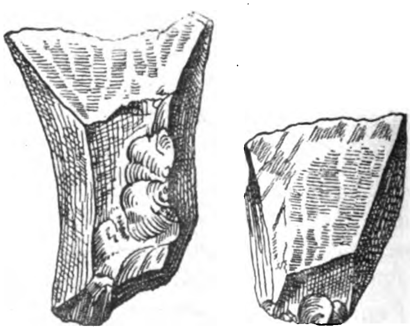
PREHISTORIC ARROWPOINTS OF BRONZE AND IRON FROM ARMENIA.

(Fig. 42) bronze, Museum of Tiflis; (figs. 41, 43) cemetery of Cheïtan-thagh; (figs. 44, 45) cemetery of Mouçi-yéri.

de Morgan, figs. 56-60. ¼ natural size.

The warrior or hunter carried all or several kinds of arrows. Their quivers when found contained an assortment. Those of bronze were in the greatest number, then iron, and lastly stone.

The archæologist exercises care in his conclusions and may refuse to accept evidence of facts which would be received by the historian without or with but little question. For example, the locality most prolific with stone arrowheads known to the author, and those of the finest quality and workmanship (Plates 2 and 3), is on the banks of Lake Thrasymene, between Cortona and Perugia, Italy, near the site (itself uncertain) of the great battle wherein Hannibal so terribly defeated the Romans, killing their commander, Flaminius, and routing their army. Yet these

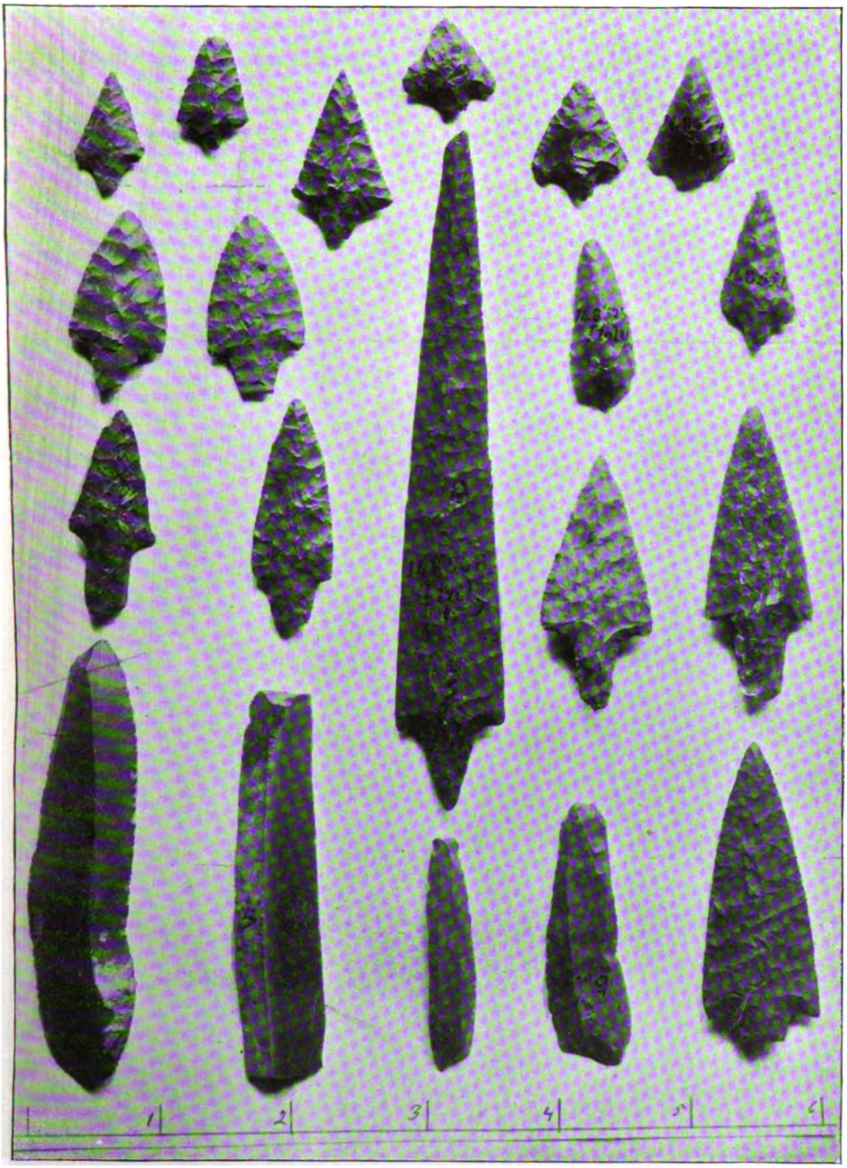


Figs. 46, 47.

PREHISTORIC ARROWPOINTS OF CHIPPED OBSIDIAN, *tranchant transversal.*

Cemetery of Mouçi-yéri, Armenia.

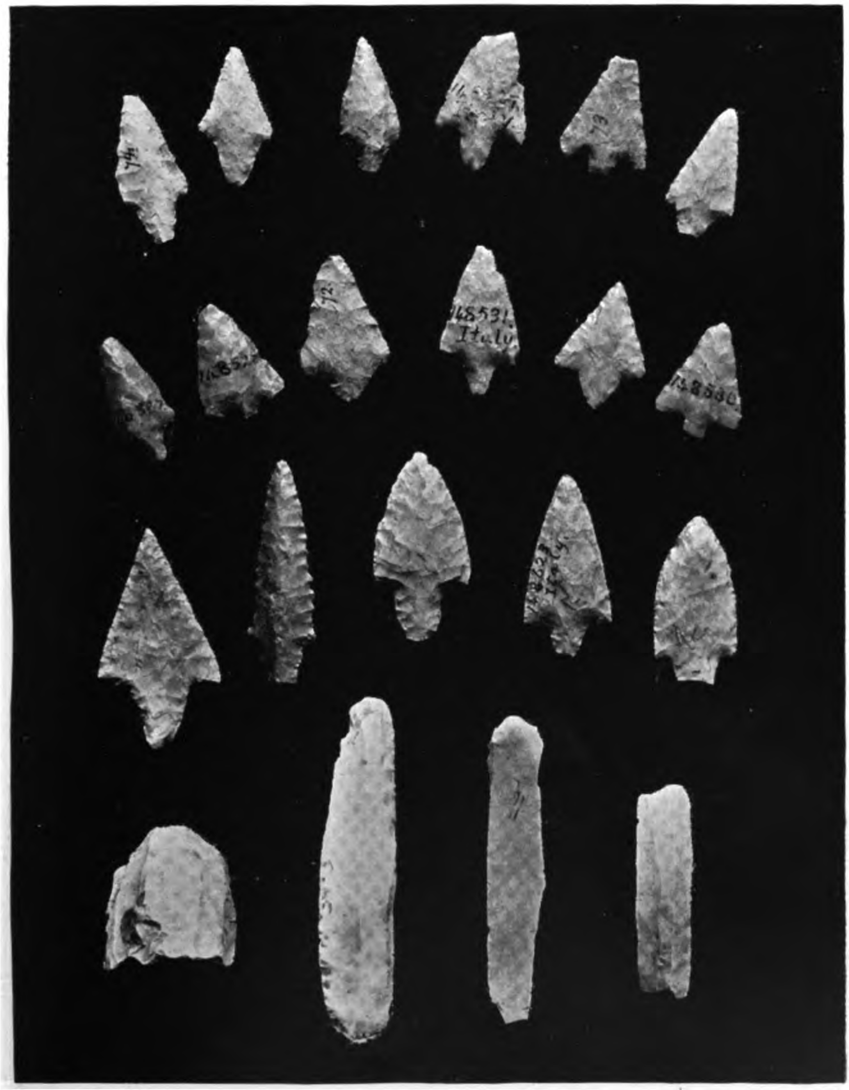
de Morgan, fig. 61. Natural size.



SPECIMENS OF FINE ARROWPOINTS.

Italy.

Cat. Nos. 148538-148556, U.S.N.M.



SPECIMENS OF FINE ARROWPOINTS.

Italy.

Cat. Nos. 148580, 148623, etc., U.S.N.M.

beautiful arrowheads found in such profusion on or so near this battlefield are believed by those archæologists who have had the best opportunity for inspection and knowledge not to have been used in that battle, nor to have had any relation to it, but belonged to an earlier epoch and another people, whether the result of a battle, the chase, or habitation of man, is as yet undecided.

III. SUPERSTITIONS CONCERNING ARROWPOINTS AND OTHER PREHISTORIC STONE IMPLEMENTS.

Antiquity of this superstition an evidence of their long disuse as weapons—Elf darts or witches' arrows—Pierre de foudre, pierre de tonnerre, pietra du fuocó—Amulets—No superstition concerning arrowheads in America—Used by Indians as weapons and only occasionally as charms.

The superstitious regard for stone arrowpoints and the belief in their supernatural origin, in most Oriental and European countries, is inconsistent with the knowledge of, or belief in, their human manufacture for use as arrows.

No people, however primitive or ignorant, having an object in common use, known by them to be of human manufacture for utilitarian purposes only, will regard it with superstitious reverence or accept it as having a heavenly origin or supernatural power. That these arrowpoints, with other objects of similar age and origin, have been so regarded by the people of the Oriental and European countries is easily demonstrated.

The superstition concerning the polished-stone hatchet and the stone arrowpoint has existed all over Europe and a large portion, if not all, of Asia and Africa; and these objects have been, and in many places still are, regarded as of a heavenly origin and as having supernatural powers. While this superstition usually belonged to the peasantry, there were many educated persons who believed it. Like the belief that the fossil animals found in the rocks were bits of broken stars fallen from the skies, until their true character was discovered by Leonardo da Vinci and Bernard Palissy, there was no way of accounting for them. So when in the nineteenth century prehistoric man was discovered, these stone implements were immediately recognized as his work, and the belief in their supernatural character began to die out. Of course, a tradition as old, as widespread, and as firmly believed among the peasantry, who read little and traveled less, would naturally be slow to yield, and so in certain localities and with certain peoples its remains are yet to be found. They have been called "lightning stones" and "thunderstones" in many languages. These names are frequently applied to both the stone hatchet[1] and the arrow-

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[1] Descriptions and figures of these are given in the author's paper on Prehistoric Art, contained in the report of the U. S. National Museum for 1896, pls. 34-37, figs. 95-99.

point, though in some localities a difference is recognized and the latter are called "elf darts," etc.

It is no uncommon thing to hear older peasants in rural districts in France deny all knowledge of stone hatchets or arrowpoints or spear-heads, for the sole reason that they do not recognize the objects by these names. Let one ask for pierre de foudre or pierre de tonnerre, and he would receive an affirmative answer at once. Conseiller Fornier, of Rennes, tells of a peasant who possessed one of these stone implements that he had seen come from the heavens in a flash of lightning. It struck in a neighboring field and, on his going to the place, he found the hole from which he extracted this implement still hot, and he had kept it ever since.

The belief is that these objects are protection against fire, especially lightning, and they are kept as protective amulets, some of the hatchets being drilled, while the arrowpoints are set sometimes in silver, sometimes in gold. When thus arranged they are more or less ornamental and are intended for personal use, though occasionally they are hung at the bed head, or near it, to guard the owner during sleep. The undrilled ones are placed about the house, inserted in any ledge in the stones of the fireplace, on or over the mantel, or in a crack near the door.

The terms elf bolt, elf shot, or elfin arrow are applied throughout the Scottish lowlands to the flint arrowhead. The Gaelic name, sciathee, is synonymous. In Shetland and Orkney the same idea, suggested there by the corresponding term, thunderbolt, is more frequently applied to the stone hatchet.

The elf arrow continued until a recent period to be esteemed throughout Scotland as a charm against the malice of elfin spirits and the spells of witchcraft. Sewed in the dress or worn on the person it was available for the protection of the individual, and is occasionally to be met with perforated or set in gold and silver, to be worn as an amulet.

The collection of the Society of Antiquaries of Scotland contains an "elf dart" set in silver, which has been worn as an amulet. A flint arrowhead forms the central pendant of a Greek or Etruscan gold necklace in the British Museum. Like other weapons of elfin artillery, it was supposed to retain its influence at the will of the possessor, and thus became the most effective talisman against elfish malice, witchcraft, or the evil eye. It is popularly believed when cattle are sick that they have been stricken by these fairy or elfin weapons.

> There ev'ry herd by sad experience knows
> How, winged with fate, their elf-shot arrows fly,
> When the sick ewe her summer food foregoes,
> Or stretch'd on earth the heart-smit heifers lie

Old country people tell odd stories of this distemper among cows. When elf-shot the cow falls down suddenly as if dead; no part of the skin is pierced, but often a little triangular flat stone is found near the

breast, as they report, which is called the elf's arrow. The cattle doctor feels the animal over and over and does not fail to find one or more elf darts in the skin. These are placed in water, which is given the creature to drink, and the cure is, of course, speedily effected.

Pennant,[1] after referring to the cure of cattle bewitched by elf shots by making them drink the water in which an elf arrow has been dipped, adds:

The same virtue is said to be found in the crystal gems and in the adder stone; for that reason the first is called clach bhuai, or the powerful stone. Capt. Archibald Campbell showed me one, a spheroid set in silver, for the use of which people came above a hundred miles and brought the water it was to be dipped in with them, for without that in human cases it was believed to have no effect.

Pepys records, on the authority of Dr. Hicks, a circumstantial story of elf arrows with which Lord Tarbut entertained the Duke of Lauderdale, and he adds:

I remember my Lord Tarbut did produce one of these elf arrows, which one of his tenants took out of the heart of one of his cattle that had died an unusual death.

The feats of the witches of Auldearn furnish some of the most marvelous narratives in Pitcairns's Criminal Trials. Among other disclosures, they describe a cavern in the center of a hill where the archfiend carries on the manufacture of such elf arrows with the help of his attendant imps. The latter perform the preparatory work, shaping the crude blocks and chipping the arrows out of the flint flakes, after which they receive from the master fiend their finishing form and point.

In Ireland flint arrowheads were regarded as potent spells against the influence of witchcraft and the evil eye, an elf arrow being frequently set in silver and worn about the neck as an amulet against being elf-shot.

We can not err in assuming that at the earliest period of the Northmen, exercising an influence in Scotland sufficient to assimilate the popular superstition, the period to which the flint implements pertain was only known as a state of society so different from the historic traditions with which the people were familiar, that they referred its weapons and implements to the same invisible sprites by whose agency they were wont to account for all incomprehensible or superhuman occurrences. And we may infer from what all other evidence confirms, that the close of the Scottish stone period belongs to an era many centuries prior to the oldest date of the written history of the country.

This ancient superstition is not peculiar to Scotland and Ireland. In Norway, diseases, not only of cattle but of men, were called by the name "alfshot," and in Denmark, "elveskud"—that is, elf-shot—though the flint arrowpoint is not recognized there as the bolt which furnishes the quivers of malignant elves. But other, and probably more ancient Scandinavian legends prove the existence of similar northern associations with the primitive arrowpoint.

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[1] Journey in Scotland, I, p. 115.

The name still applied to the elf bolt by the Norwegian peasantry is "tordenkiler," or thunderstone, so that we can feel little hesitation in assigning to the old Norse colonists of Orkney the difference still discernible in these expressions of the same popular idea. In the Fornaldar Sogur Nordlanda, or legends from the primitive period of the north, derived from ancient manuscripts, Orvar Odd's saga furnishes a curious evidence of this. The hero, who is already furnished with three iron arrows, the gift of Guse, a Finnish king possessed of magic power, is hospitably entertained in the course of his wanderings by an old man of singular appearance.

On the side where the old man sat he laid three stone arrows on the table near the dish. They were so large and handsome that Orvar thought he had never seen anything like them. He took them up and looked at them, saying: "These arrows are well made." "If you really think them to be so," replied his host, "I shall make you a present of them." "I do not think," replied Orvar, smiling, "that I need cumber myself with stone arrows." The old man answered: "Be not sure that you will not some time stand in need of them; I know that you possess three arrows, the gift of Guse, but, though you deem it unlikely, it may happen that Guse's weapons will prove useless; then these stone arrows will avail you." Orvar Odd accordingly accepted the gift, and chancing soon after to encounter a foe who by like magic was impenetrable to all ordinary weapons, he transfixed him with the stone arrows, which immediately vanished.

The Danish collector, Olaf Worm, describes[1] the chipped flint spearheads and daggers as being of doubtful origin, and that some persons regard them as thunderbolts.

Even in Japan flint and obsidian arrowpoints are regarded as the weapons still in use by spirits. The popular belief is that every year an army of spirits fly through the air with rain and storm; when the sky clears the people go out and hunt in the sand for the stone arrowheads the spirits have dropped. Dr. Jannsen states that the Japanese keep ancient stone implements in their chapels, treating them with religious veneration. According to Dr. Schwaner, ancient stone hatchets are still more carefully preserved by the present inhabitants of Borneo in bags woven of cane and suspended in the recesses of their dwellings among their talismans and amulets.[2]

This variation in the popular mode of giving expression to the idea of a supernatural origin for these primitive weapons is worthy of note from the definite evidence it affords of a period when stone weapons were as much relics of a remote past and objects of popular wonder as now.

The collection of amulets made by Professor Belucci of Italy, shown in the Paris Exposition in 1889, contained the following, which had been worn or kept as a protection against fire and lightning: Polished-stone hatchets, jadeite 15, serpentine 12, aphanite 2, lydite, quartzite, and argillite, 1 each—32; arrowpoints or spearheads, flint 36, pyrites 4, calcite 1—41; total, 73.

The superstitious belief in these objects is not confined to any par-

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[1] Museum Wormianum, A. D. 1655, pp. 39, 85.

[2] Stevens, Flint Chips, pp. 87, 88.

ticular place or country. It is equally prevalent in Germany, France, Italy, Spain, and Portugal. In Brazil these objects are called "corsico,"[1] but it is possible this may be only a name brought over from Europe by the conquistadores. In Italy they are called "pietra di fuoco," in France "pierre de tonnerre" or "pierre de foudre," in Spain "piedra de fuego" and "piedras de rayo."

A belief in the supernatural origin of stone arrows and hatchets is as common in China as it is in other parts of the world.[2]

The collection of M. Van de Poel, of 39 prehistoric objects from Java, was presented by him to the Academy of Sciences, Paris. "The specimens were obtained with difficulty, as the natives regarded them with religious veneration."[3] The Malays call them "gigi guntur" (teeth of the lightning).

This supernatural character has been recognized more or less among all peoples as far back as history goes. Sir John Evans[4] says:

> Enough, however, has been said with regard to the superstitions attaching to these arrowheads of stone. The existence of such a belief in their supernatural origin, dating, as it seems to do, from a comparatively remote period, goes to prove that even in the days when the belief originated, the use of the stone arrowhead was not known, nor was there any tradition extant of a people whose weapons they had been.

In Greece, as early as the time of Pliny, the stone arrowpoints, along with polished-stone hatchets, were believed to have fallen from the stars. The latter were called "astropelchia" or thunderbolts. Pliny, quoting Sotacus, says there are two sorts, "the black and the red, saying they do resemble halberds or ax heads. Such as be found withal are endued with this virtue, that by means of them cities may be forced and whole navies at sea be discomfited."

Aldrovandus[5] engraves a flint arrowpoint as a fossil glossopetra, a stone which, according to Pliny,[6] "resembleth a man's tongue and groweth not on the ground, but in the eclipse of the moone falleth from heaven," and which "is thought by the magicians to be verie necessarie for those that court fair women."

In the catalogue of the museum at Gresham College[7] they are called "anchorites," because of their likeness of form to an anchor. Reference is made to the collection of similar objects in the Worm Museum.

Flint continued to be used in some parts of Egypt until the twelfth dynasty, 2600 B. C. Mr. Flinders Petrie in 1889 excavated the ancient settlement Medinet Kahun, the pyramid of Unsertesen II, and there found and brought back to London, where they were exhibited at Oxford Mansion, a bushel or more of flint chips and wrought flakes.

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[1] Stevens, Flint Chips, p. 89.

[2] Evans, Ancient Stone Implements, p. 116; Mémoire concernant l'Histoire des Chinois par les Missionnaires de Pékin, IV, 1776, p. 474; VI, p. 467.

[3] Mortillet, Matériaux, II, p. 212; Evans, Ancient Stone Implements, p. 118.

[4] Ancient Stone Implements, p. 328.

[5] Musaei Metallici, Book IV, chap. 17, p. 604.

[6] Naturalis Historia, Book XXXVII, chap. 10.

[7] London, 1618.

Some of the flakes were inserted in a wooden sickle and made the cutting edge of the implement, while the flakes were many of them wrought (all done by chipping) into spear or lance heads. The author purchased a number of both kinds, and they are now exhibited in the U. S. National Museum (plate 4).

Sir John Evans[1] reports a chipped-flint arrowpoint fastened to its shaft with bitumen, displayed in the British Museum, found in an Egyptian tomb. The dynasty and consequently the date is not given; it may not be known.

This extended and universal superstitious regard for these implements as a class is incompatible with their use as weapons by the same people, and the antiquity of the superstition demonstrates the antiquity of their desuetude.

This superstition never attached to these objects in America, for with its discovery came also the discovery that the objects heretofore regarded as supernatural and of heavenly origin were naught but the tools and weapons of savage man. Following this discovery by the white man, came the other discovery by the Indian—that his implements and weapons could be made more easily and quickly of metal than of stone, and straightway the use of stone for this purpose was superseded by metal.

Lieutenant Niblack, U. S. N., in his "Indians of the Northwest Coast,"[2] remarks:

> On the introduction of iron, which both Cook and Dixon attribute to the Russians, the Indians were not slow to adapt it to their purpose. Dixon says that in Captain Cook's time iron implements were then also in use among the Tlingit and Haida.

And on page 209: "For salmon spears * * * steel is now generally used."

On the advent of the white man, the making of arrowpoints or spearheads of stone practically came to an end among our North American Indians, even though they remained savages. They soon found that a rejected and broken barrel hoop or other piece of strap iron would make more arrowheads than would a hundred times its weight in flint, with less labor and in shorter time. Not only were they more easily made, but were lighter; as ammunition they could be carried in greater number, and were in every way more effective as a weapon. Neither the epoch of transition from stone arrowpoints to those of iron, nor the length of time in making it, by the North American Indian, can be told with accuracy, but we may be reasonably certain that he would not long continue to make them of stone after he had the material and the tools—that is, the strap iron and a file or chisel—and the knowledge to use them. The Indian traders soon discovered the Indian needs, and after beads, glass, and tomahawks, the cargoes contained iron and sometimes files and chisels by which the arrowpoints and knives could be made, if they did not carry the arrowpoints and knives already made.

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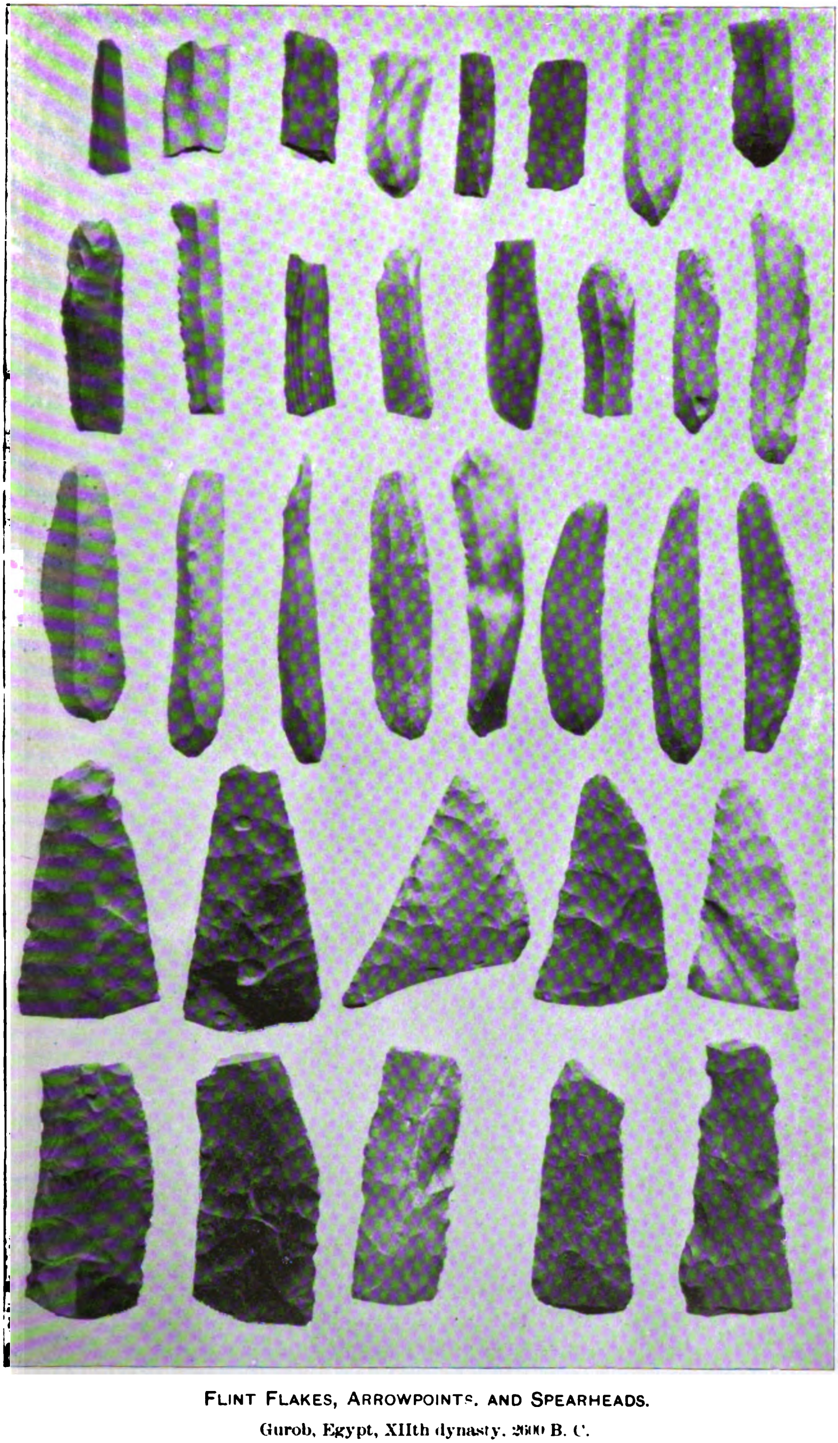
[1] Ancient Stone Implements, p. 329.

[2] Report U. S. National Museum, 1888, p. 280.



FLINT FLAKES, ARROWPOINTS, AND SPEARHEADS.

Gurob, Egypt, XIIth dynasty, 2600 B. C.

Cat. Nos. 197915-197917, U.S.N.M. Collected by W. Flinders Petrie.

This may not have begun with the first moment of contact with the white man. The first Indian trader may not have taken iron arrowpoints or the material or tools with which to make them, but we may fairly conclude he did soon after. These materials took rank in importance to the Indian with, if they did not precede, the glass beads and brass rings which have been the proverbial currency of Indian traders. There must necessarily have been a period of transition; stone arrowpoints would not be supplanted instantly by iron.

Doubtless there were exceptions to the generality of their use. Boys, amateur hunters, degraded tribes, those living far back in the mountains, even hunters or warriors moved by necessity or the desire to save expense, may have made stone arrowpoints or spearheads after general contact with the white man.

Rev. M. Eells, in the Stone Age of Oregon,[1] says stone arrowpoints and spearheads are scarce, and that he had seen only nine of them in eight years' residence among the Indians. The Indians did not make them; they used bone. But as evidence that they were used in ancient times, he says that Mr. Stevens has 3,200 of them, 6½ inches by 2¼ inches, down to one-half by one-fourth inch. He had found a grand cache of them unearthed at Oregon City. A workshop for making arrow and spearheads had been discovered at Umatilla Landing, with the usual nuclei, hammers, chips, and flakes, with arrowpoints and spearheads complete, incomplete, and broken, in abundance.

Mr. J. G. Swan, speaking of the Indians of Cape Flattery,[2] says:

> The bow is used principally by the boys * * * to kill birds and other small game; as a weapon of defense it is scarcely ever used, firearms having entirely superseded it. * * * The arrowheads are of various patterns; some are made of iron wire, which is usually obtained from the rim of some old tin pan or kettle; this flattened at the point, sharpened, and a barb filed on one side, and driven into the end of the shaft; a strip of bark is wound around to keep the wood from splitting. Some are of bone [of course the head is of wood, the same as the shaft]; * * * others again are regularly shaped, double-barbed, and with triangular heads of iron or copper, of very neat workmanship.

Lieutenant Niblack, U. S. N.,[3] speaking of the Indians on the northwest coast, says:

> To-day the bow and arrow survives only as a means of dispatching wounded game or to save powder and ball. * * * Few bows are now seen among these Indians except as toys for the children. Before the introduction of iron, arrowheads were of bone, flint, shell, or copper.

And on page 285:

> The primitive dagger was of stone or bone. The first daggers made by the natives after the advent of the whites were from large, flat files, and the skillful manner in which these were ground into beautiful fluted daggers challenged the admiration of the traders, who found the work as skillfully done as if by European metal-workers.

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[1] Smithsonian Report, 1886, p. 289.
[2] Smithsonian Contributions, No. 220, p. 48.
[3] Report U. S. National Museum, 1888, p. 286.

And the same remark is made on page 288 in regard to seal spears.

Not only was stone superseded by iron as a material for arrowpoints, but the bow and arrow as a weapon was superseded by firearms. As this was a greater change, so the period of transition might have been longer, but that it would come sooner or later was inevitable. The question of civilization has but little to do with the adoption of a better weapon. The wildest Indians in North America, having all the belongings of savagery, might have, within the past twenty-five years, been seen armed with magazine or breech-loading guns as fine and good as those of our army moving against them. These Indians and their guns represented the two extremes of civilization. The Indian was the lowest stratum, his gun the final effect of enlightenment in man.

Capt. John G. Bourke, of the United States Army, an accurate and close observer, an interested archæologist, a noted Indian fighter who was in that service during the principal part of his life, and a valuable aid and comrade of General Crook in some of his most celebrated Indian campaigns, gave a sketch of the weapons, tools, implements, domestic utensils, amulets, etc., of certain tribes of Indians as they were when he first met them, in a paper read by him before the Anthropological Society at Washington, under the suggestive title of "The Vesper Hour of the Stone Age."[1] As resulting facts of his observations, in the twenty-three or twenty-five years of his service, since his first acquaintance with the wild tribes of the Rio Grande, the Gila, and the Colorado, he has seen them "not only subjected to a condition of peace, but notably advanced in the path of civilization, their children trained in the white man's ways, and all traces of earlier modes of life fast fading into the haze of tradition." Doubtless the North American Indian had his myths concerning the arrow. But these are quite different from the superstitions in the Old World concerning the arrowhead; those were based on the belief in the supernatural origin and power of the object, and were inconsistent with its character as a weapon. The myth in America might relate to the arrow as a charm or for divination, to find lost objects, search for game, etc., but it in no wise affected their knowledge of its having been made by man, to be used as a weapon.

On the subject of arrows as charms or amulets, Captain Bourke says[2] that all the American aborigines used stones as amulets. And he says instances of throwing arrows and stones "for luck" are given by Ross, Mackenzie, Castañeda, Picart, and Gomara. As to the myths of the arrow, he refers to Bancroft, Torquemada, Bascana, and others, and says:[3]

> Arrows fired under circumstances of special note, those which had once killed enemies or in the hands of the enemy had failed to kill the present owner, became tal-

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[1] American Anthropologist, III, p. 55.

[2] Idem, III, p. 62; IV. p. 73.

[3] Idem, III, p. 62.

ismans, and were worn attached to his belt, bow, or hat. Two or three arrowheads were appended to the necklace of human fingers, which I secured in a fight with the Cheyennes of northern Wyoming during the winter of 1876, and now deposited in the National Museum. The information obtained in regard to these was always vague and far from satisfactory.

With the wonderful penchant of the North American Indians for mystery, and their delight in superstition; with their belief in "medicine," the power and influence of their shamans and medicine men, and the necessity of the latter to successfully impose on their followers, it would be curious if the shamans had not attributed magic power to some of these objects. With all his experience, Captain Bourke is able to give but two instances where anything supernatural has been attributed to the arrowpoint, and these were, as he said, vague and unsatisfactory.

An Apache squaw who claimed great skill as a midwife was in the habit of administering a pinch of powdered arrow in water in cases of painful gestation or protracted labor. She explained to him that whenever lightning happened to fell a pine tree on the top of a high mountain, the medicine man would hunt for any rock at the foot of the blasted trunk which would yield fire when struck. He saw one of these medicine arrows in the possession of an Indian woman in the pueblo of Acoma, New Mexico, in 1886, and the owner acknowledged its uses to be identical with the same amulet of the Apaches, but refused absolutely to dispose of it.[1]

The manufacture and use of stone arrowpoints undoubtedly continued much later in the western countries of the United States than it did in the eastern, because that country was discovered later. It is not unlikely that there may have been Indians in the wilder countries who, in cases of stress, continued to make and use these implements into comparatively modern times. But "comparatively modern" is only a relative term. All our knowledge relating to modern savagery in America dates from contact with the white man. This contact is the line between the historic and the prehistoric. Prior to that period of contact the white man, who was the historian, had no knowledge of the Indian or his history or customs, and from that moment both his history and customs began to change.

It would follow that, unless falling within the exceptions mentioned, the common arrowpoints and spearheads in the Museum and other collections in the United States are practically prehistoric. Those from the East are admitted without question to be so, but they are no more so than those from the West. The discoveries and conquests of the Indians in the West by the whites are nearer our own times, and this accounts for the principal differences in our opinions. Contact between the Indian and the white man was the first step; the second was the obtaining of Indian lands by purchase or war, and the third was subjugation. This process proceeded faster in the West than it did in the

[1] American Anthropologist, III, p. 62.

East, and, as a consequence, the transition from savagery to civilization, from prehistoric to historic, from the bow and arrow to the rifle, has been correspondingly faster in the West than in the East.

IV. FLINT MINES AND QUARRIES IN WESTERN EUROPE AND IN THE UNITED STATES.

As all arrowpoints, spearheads, and knives, except a few of slate, were chipped or flaked into shape and used in that condition, the prehistoric man would naturally seek a material which had the requisites for such working. Flint and its kindred (the finer being chalcedony, the coarser chert and hornstone), obsidian, jasper, quartz, and quartzite were the principal substances. Obsidian is comparatively rare, and the last three were more or less refractory and would be used only when the better material could not be obtained. Flint was the best. It combined the greatest desiderata with the greatest facility of procurement, and was consequently the favorite material of prehistoric man during the polished-stone age, in Europe as well as in America. Of the 203 specimens of arrowpoints, spearheads, or knives shown in Plates 35 to 47 of this paper, 144 are of flint, chalcedony, or chert. These are all silicates of a crystalline structure, almost all cryptocrystalline. Flint can be chipped in any direction. It breaks with a conchoidal fracture, and can be struck off in long, straight, even, and thin flakes. It is tough and hard, holds a sharp edge and point, and is not difficult to work.

Quarries or mines of flint in different parts of the world were known and were worked in prehistoric times. The author proposes to describe some of the more important, preferring those which he has visited and inspected, using them as illustrations of others which will be only named. Associated with these mines or quarries are workshops where the various implements were manufactured. He also proposes to compare some of the mines or quarries and the material of Europe with those of the United States.

EUROPE.

Spiennes, Belgium.—Spiennes is a hamlet in the neighborhood of the city of Mons, in the province of Hainault. It is on the railway from Mons to Charleroi, and the station is Harmignies, the first after leaving Mons.

The author had the honor to be United States consul at the city of Ghent, in the province of Flanders-Oriental, which adjoins that of Hainault on the north, and so had opportunities of frequent visits to Mons, which is the center of an extensive mining district, principally of coal. He formed the acquaintance of M. F. Cornet, a civil and mining engineer. M. Cornet, with his colleague, M. Briart, made the report upon the prehistoric flint quarries and workshops in the province of Hainault to the International Prehistoric Congress at Brussels in 1872. The members of that congress made an excursion to this locality. There were two objects of interest; one was the prehistoric flint quar-

ries and workshops at Spiennes, which belong to the Neolithic or polished-stone age; the other was at a neighboring locality called Mesvin, where had been found evidences of the workings of man during the Paleolithic period.

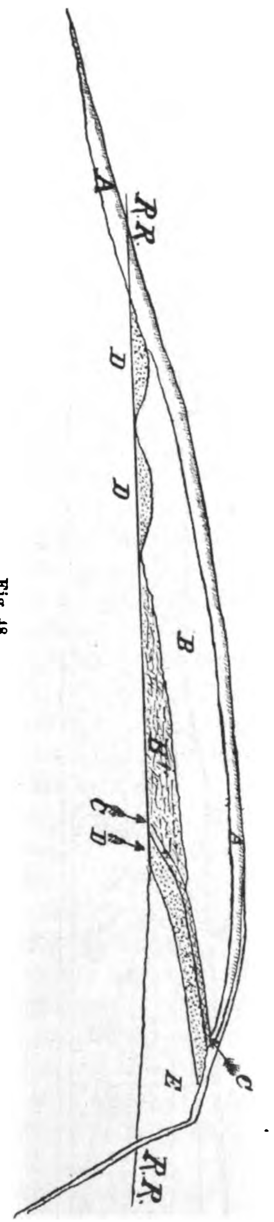


Fig. 48.

SECTION SHOWING GEOLOGY OF PREHISTORIC FLINT MINE.

Spiennes, Belgium.

Scale: Length, 1-5000; height, 1-1000.

RR, profile of railroad; *A*, brick clay; *B*, clay; *B'*, sandy clay with animal bones; *C*, sand containing pebbles, worked flint, débris, and bones of elephant and rhinoceros; *D*, eocene deposit of sand; *E*, white chalk with nodules of flint frequently arranged in strata; *F*, surface-disturbed earth containing débris of workshops, wrought and broken flint implements, flakes and chips, fragments of pottery, etc.; *G*, ancient pits and galleries which, when exhausted, were, to prevent accidents, filled with chalk, blocks, and earth containing wrought and broken flint implements, flakes and chips; *H*, layers of flint nodules in the chalk, followed in the exploitations; *I*, filling of kitchen refuse, charcoal, worked flakes and chips, fragments of pottery.

The mines of flint at Spiennes cover about 50 acres, and the surface for twice that area is strewn with pieces that have been more or less worked, and are evidence of human industry and occupation in prehistoric times. M. Neyrinck collected many of these pieces, which he deposited in the Prehistoric Museum at Brussels. The first discovery of these pieces was by Albert Toilliez, who made a collection of the material, implements, tools, débris, etc., in the year 1840, which in 1865 was sold to Sir John Evans.

The discoveries of Toilliez attracted the attention of students and caused further investigations, which in 1860 resulted in the discovery of the mines of flint, and that they had been worked by prehistoric man, and that the plateau had been a vast workshop.

The flint of this locality came in modern times to be exploited for the manufacture of porcelain, and in this way the excavations of antiquity were frequently encountered. In 1867 the construction of the railway from Mons to Charleroi was begun by the way of or near to the little town of Binche. The construction of the railway required a deep cutting through the plateau between the river De Nouvelles and La Trouille. On this plateau were located the flint mines of Spiennes. The locality

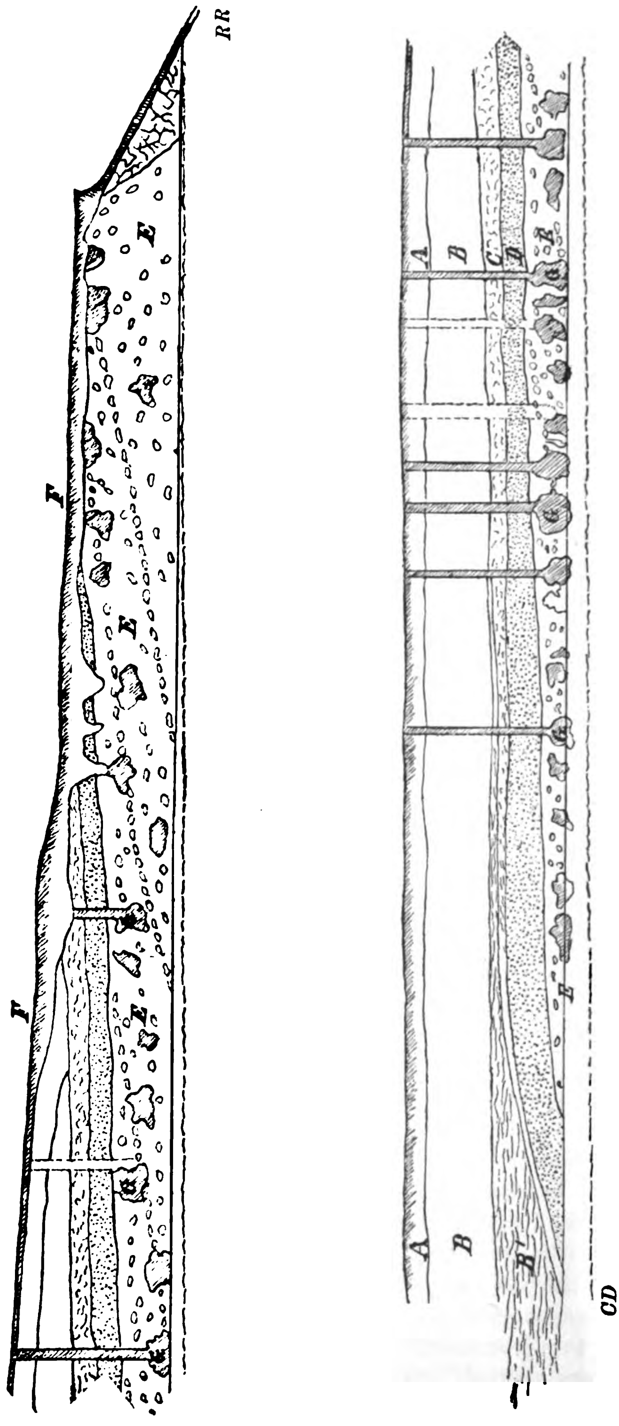


Fig. 49.

SECTION OF PREHISTORIC FLINT MINES.

Enlarged view of portion of fig. 48 from *CD* to *RR*.

Spiennes, Belgium.

(Letter of explanation of strata as in fig. 48.)

Scale, 1-500.

of the Paleolithic occupation at Mesvin is to the west of the river De Nouvelles, between it and the river Le By. A portion of the railway cut through the Neolithic flint mine at Spiennes is shown in fig. 48.

Messrs. Cornet and Briart and M. Houzeau de Lahaye were charged by the scientific society of Hainault to supervise the excavations of the railway for evidences of prehistoric man. They reported several conclusions, that which interests us being that the men of the polished-stone age had dug pits or mines into the great chalk and clay deposit to obtain flint nodules for the manufacture of their tools and weapons, and that extensive and important work had been done in these mines in times of antiquity.

The railway cut brought to light within its area no less than 25 of these pits. The cut extends about 40 feet below the surface of the plateau, which was fortunate, for it thus showed the prehistoric mines to their entire depth. These mines, as shown in fig. 49, were in the form of pits or shafts. The shaft was sunk from the surface perpendicularly through the clay and sand until it reached the chalk. The shafts were 2, 3, and 4 feet in diameter, longer than wide for facility in working, and the deepest was about 36 feet. Arrived at the chalk, galleries were thrown off horizontally in searching for the nodules of flint. The galleries were from 20 to 6½ feet in height, and from 3.3 to 9 feet in width. An enlarged view of one of these shafts and mines shows its corresponding gallery pushed to the right and left, through the chalk, in search of the nodules of flint therein contained. There are no means of determining the number of these shafts, nor the number or extent of the galleries, without an extensive system of trenching throughout the plateau, which would be too expensive; but a fair idea can be gathered of it when it is said that the entire surface of the plateau is dotted with the filled shafts. They are found every few rods. If one digs beneath the surface but little more than the depth of the plow, he will find an ancient shaft. Several of them have been excavated to the bottom and the galleries followed to their ends. The differences in the earth, filled in and natural, render them recognizable with certainty.

In fig. 50 the shaft communicated with the surface by an opening shown on the right. Whether this was natural or artificial was undetermined. The débris with which it was filled represented everything met with in the exploration. It was a confused mass of sand, lime, blocks of chalk, chips, flakes, and nodules of flint, with the bones of different animals, pieces of pottery, and not infrequently implements of bone, deer horn, and flint.

The mouths of these shafts were usually broken away around the sides, giving them somewhat the form of a funnel. But this was only for a short distance down, when the sides or walls of the pit became perpendicular (figs. 51, 52).

The pits and galleries were sometimes caved in, but usually they

had been filled by the workmen to prevent caving. One obtains great insight into the domestic and industrial life of this people by examining this filling: for, in addition to the earth and chalk which had been

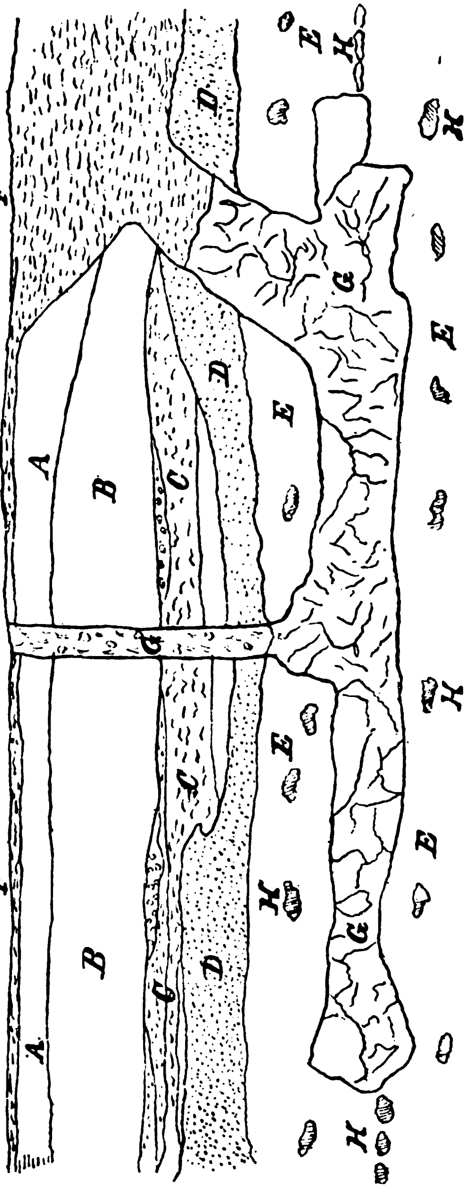


Fig. 50.

SECTION OF SHAFT IN THE PREHISTORIC FLINT MINES, SHOWING ANCIENT WORKINGS AND HOW THEY WERE FILLED.

Spiennes, Belgium.

(Letter explanation of strata as in fig. 48.)

Scale: 1 inch equals 13 feet.

dug out, it contained the broken tools and implements and the refuse of his kitchen. The domestic utensils used by him during the progress of the work would be broken, used up, and cast away or lost, and so go into the refuse pile. There were bones of animals used for food,

usually split and broken for the extraction of marrow, bone points, pieces of rude pottery vessels used to cook or carry food or drink, traces

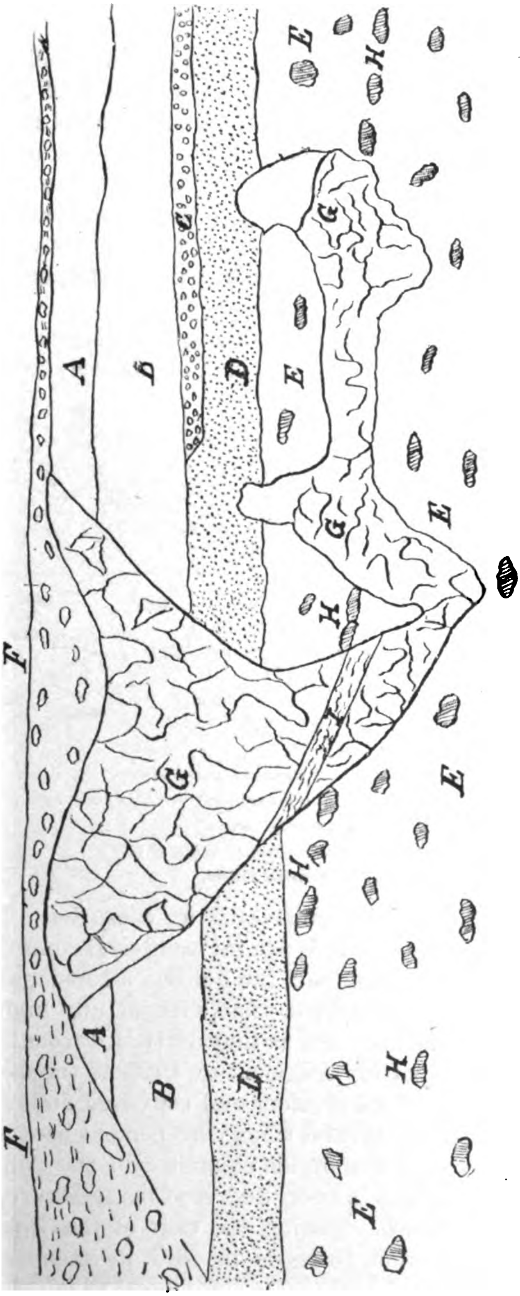


Fig. 51.

SECTION OF SHAFT IN THE PREHISTORIC FLINT MINES, SHOWING ANCIENT WORKINGS AND HOW THEY WERE FILLED.

Spiennes, Belgium.

(Letter explanation of strata as in fig. 48.)

Scale: 1 inch equals 13 feet.

of charcoal and fire with which the workmen had cooked their food or kept themselves warm. Of the tools and implements lost or broken

and cast away, were flint picks, flint flakes and points, deer antlers, and in the workshops were pieces of the knives, hatchets, arrow-points, and other implements broken in the course of manufacture—the "failures" of the workmen.

The tools used for mining were sharp picks of flint similar to cores figs. 7, 8, 9, and flakes figs. 3, 4, 5, 6 (Plate 5), probably held in the hand while digging, and picks of deer horn, one of the palms forming the handle and a prong forming the pick, such as were found at Grimes Graves by Canon W. Greenwell (Plate 6). There was no evidence in the galleries of the making or sharpening of these implements, and it was believed that this was done at the surface; nor were there evidences of the means of ascent and descent, nor yet that of lifting out the flint.

The entire plateau has been leveled during all historic time. The holes or funnel-shaped excavations which had formerly existed were

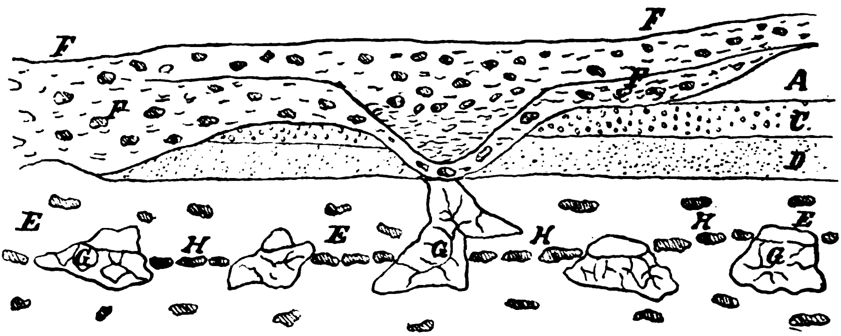


Fig. 52.

SECTION OF PIT IN THE PREHISTORIC FLINT MINES.

Enlarged view of figure, showing ancient workings and how they have been filled.

Spiennes, Belgium.

(Letter explanation of strata as in fig. 48.)

Scale: 1 inch equals 13 feet.

filled up, and the fields had been cultivated for centuries. There was nothing about its appearance to indicate its wonderful condition. The owner, the farmer, the plowman, and the hunter, all had passed over its surface from the earliest historic time without any knowledge of what lay beneath the surface, except as they derived it from the chance finds of worked flint and pottery fragments. Prior to the discovery of prehistoric man, this débris told no story and conveyed no idea. After the discovery of prehistoric man, and when wise persons became observant and sought for the evidence of his existence in the chips, flakes, and nuclei, broken and worked in every degree of manufacture, this field became a volume of evidence. During the visit of the International Archæological Congress from Brussels in 1872, its members spread themselves over the field and gathered every morsel which showed evidence of human workmanship with much the same assiduity as the miner in his search for gold. This field has always been an attraction to

EXPLANATION OF PLATE 5.

1 2

3 4 5 6 7

8

9 10 11

Figs. 1–6. Flint Flakes.
(Cat. Nos. 100256–100258, U.S.N.M. Thomas Wilson.)

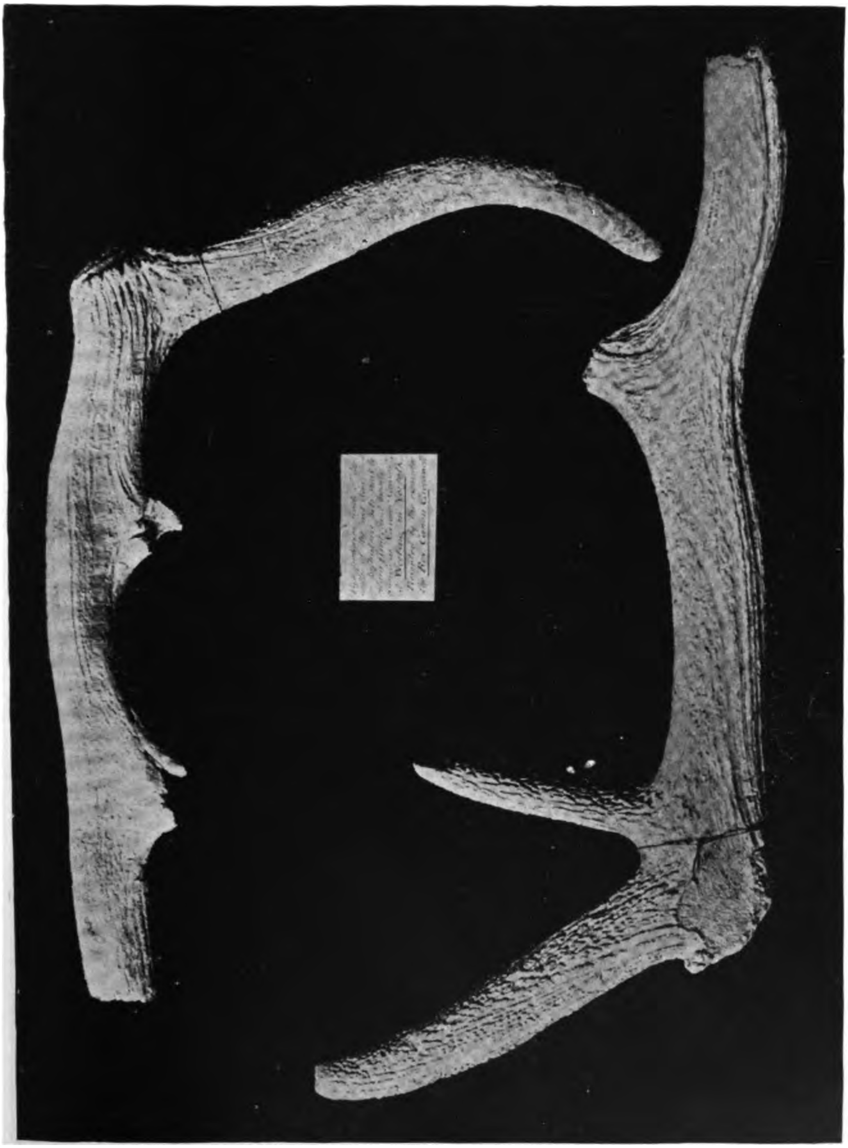
Figs. 7, 10, 11. Flint Picks.
(Cat. Nos. 100255, 100260, 100262, U.S.N.M. Thomas Wilson.)

Fig. 8. Hammerstone.
(Cat. No. 100255, U.S.N.M. Thomas Wilson.)

Fig. 9. Part of Chipped Hatchet.
(Cat. No. 100264, U.S.N.M. Thomas Wilson.)

POINTED FLINT FLAKES, PICKS, HAMMERSTONES, AND CHISELS.

Spiennes, Belgium.



DEERHORN PICKS.

Grimes Graves and Brandon, Suffolk, England.

students of prehistoric archæology, and has been visited by the leading authorities of that science of Europe. There has been no restriction by the owner of the land upon the carrying away of as many pieces of flint as the visitors may desire, and this permission has been used to a surprising extent. Yet when the author visited this field ten and thirteen years afterwards, pieces of worked flint were apparently in as great profusion as in the first instance. The search of a single afternoon over its surface secured such a number of these specimens that he was unable to carry them, and a peasant was employed to transport them to the railway station. So numerous were the evidences of prehistoric human industry, that despite the great desires and long-continued efforts of the farmer to rid his field of these stones, yet in many places they constituted, for a depth of 2 or 3 feet, a large proportion of the earthy material. The photographic plate of samples (Plate 5) gives a fair idea of the commoner objects, such as broken hatchets, cores, picks, hammer stones, scrapers, and flakes.

Cornet and Briart are both dead, but their places have been taken by Baron de Loë and M. de Munck, who have continued the work, and the author was fortunate enough to have heard, at the International Prehistoric Archæological Congress in Paris, 1889, their joint paper describing the continuation of their investigation and the discoveries of the workshops supplied by flint from these mines. It was the opinion of these observers that the material had been divided up at the pit's mouth and carried to different workshops in the neighborhood, there to be manufactured into implements. The theory was advanced that these workshops had been specialized so that only one kind of implement was made in each shop or by each workman. The investigations showed that there had been a division of labor, and that each workman or each band of workmen had been confined practically to the manufacture of a single class of implements.

The hatchet was the principal implement, yet there were all kinds of scrapers, picks, arrowpoints and spearheads, and flakes in great numbers, probably intended for use as knives. These were in all stages of manufacture, from the rudest chipping to the finished (Plate 5). The hatchets were only chipped to proper form ready for polishing.

The structure of flint is such that it is better worked by chipping than by pecking. Granite and kindred material is wrought by pecking or hammering, but flint by chipping. In European prehistoric workshops most of the rough work was by chipping and not by pecking or hammering. The workshops are to be traced by the chips and refuse, and closer investigation showed them probably to have been huts, which may also have served as habitations for the workmen. There were depressions in the surface, and the ground was pounded hard, as though it had been for a floor. These observers thought they could, in some cases, discover the evidence of the wooden material of which the hut had been built. The workshops all occupied high and

commanding positions, many of which, never having been cultivated, were unchanged from the times of antiquity, and so furnish excellent evidence of their prehistoric occupation.

It was the opinion of Baron de Loë and M. de Munck that the flint implements made in the workshops of the neighborhood had been the foundation of an extensive commerce, by which they had been distributed over southern Belgium and northeastern France. M. de Munck had found 15 Neolithic stations, extending over 45 communes, all in direct relation with Spiennes, creating a network of roads which had remained in use until modern times.

Grand Pressigny.—Grand Pressigny, in the department of Indre-et-Loire, France, a few hours' ride southwest of Tours, is the center of a district rich in flint, which was much utilized during the Neolithic period.

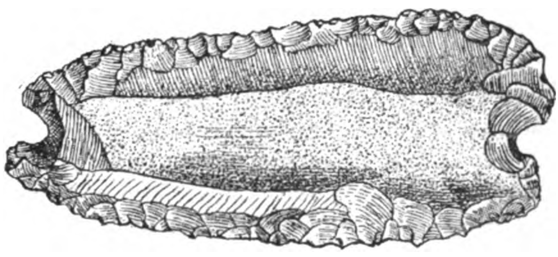


Fig. 53.

FLINT IMPLEMENT; THE PECULIAR PRODUCT OF A PREHISTORIC WORKSHOP.

Grand Pressigny (Indre-et-Loire) France.

There was no mine proper, but an extensive workshop for the manufacture of flint implements (Plate 7). The débris still encumbers the ground for miles around to such exent as to impede cultivation, and furnishes flint for the reparation of the road and for building purposes. Many of the neighboring houses have been built either with foundations or first stories of the flint nodules. The parapet of the bridge, on which we pass over the stream into the town, is of flint. The cores are most plentiful and are called, from their color and shape, "livres du beurre," pounds of butter (Plate 7, fig. 3). They have been so wrought as to enable the workmen to strike off, sometimes one, sometimes three, flakes of remarkable length, 12 to 16 inches (Plate 7, fig. 4). These flakes may have been used as knives, but they were many times worked into spear or lance heads. Here also was a division of labor, for in certain workshops these flakes alone would be found; in others, notably the hamlet of Epargne (Philippe Salmon), the peculiar saws or scrapers notched in the end were to be procured (fig. 53). But the remarkable thing about it all was the great demand in prehistoric times for these spearheads and knives and the extensive commerce they commanded. Because of its peculiar yellow or waxen color, the flint of Grand Pressigny is easily recognizable, and so can be traced in its migrations through 27 departments in northern, western, and central France, and even into some of the lake dwellings of Switzerland. Specimens of it have been found in the dolmens, associated with some

EXPLANATION OF PLATE 7.

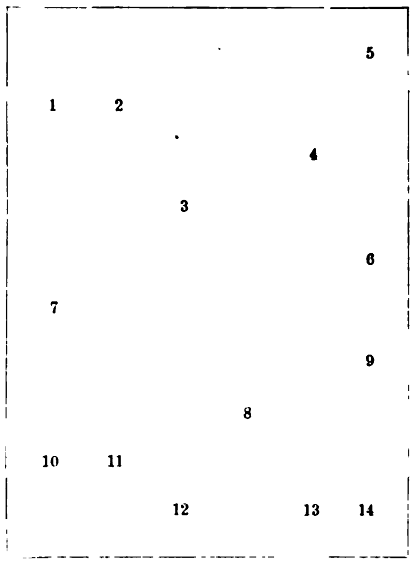


Fig. 1. Worked Flint Flake.
(Cat. No. 99908, U.S.N.M. Grand Pressigny (Indre-et-Loire), France. Thomas Wilson.)

Fig. 2. Large Flint Flake.
(Cat. No. 99818, U.S.N.M. Laugerie Haute (Dordogne), France. Thomas Wilson.)

Fig. 3. Flint Core.
(Cat. No. 146062, U.S.N.M. Grand Pressigny (Indre-et-Loire), France. Thomas Wilson.)

Fig. 4. Large Flint Flake Cast.
(Cat. No. 136651, U.S.N.M. Grand Pressigny (Indre-et-Loire), France. Thomas Wilson.)

Fig. 5. Worked Flint Flake, Point.
(Cat. No. 35163, U.S.N.M. Loire Valley, France. Gaston L. Feuardent.)

Figs. 6, 9. Worked Flint Flake, Points.
(Cat. Nos. 35201, 35202, U.S.N.M. Lake Bienne, Switzerland. G. L. Feuardent.)

Fig. 7. Large Flint Flake (knife).
(Cat. No. 35160, U.S.N.M. Preuilly (Indre-et-Loire), France. G. L. Feuardent.)

Fig. 8. Rude Flint Spearhead.
(Cat. No. 99911, U.S.N.M. Grand Pressigny (Indre-et-Loire), France. Thomas Wilson.)

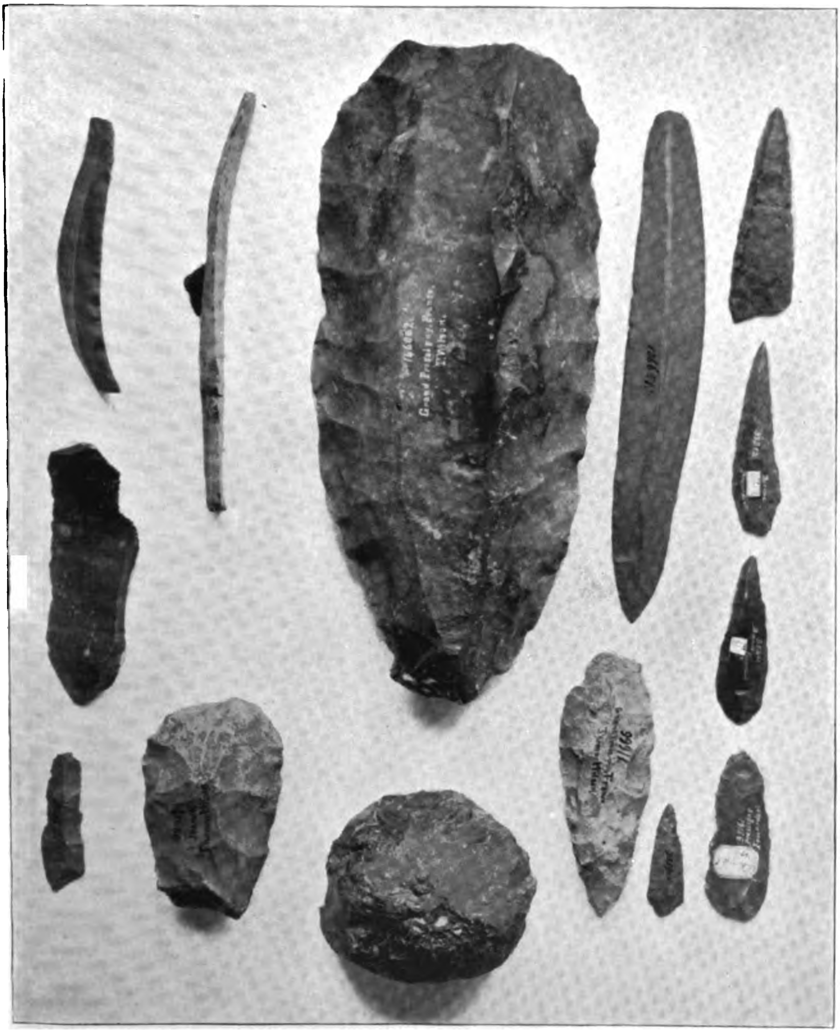
Fig. 10. Small Flint Flake (cutting tool).
(Cat. No. 99907, U.S.N.M. Grand Pressigny (Indre-et-Loire), France. Thomas Wilson.)

Fig. 11. Rude Chipped Implement.
(Cat. No. 99917, U.S.N.M. Vendome (Loir-et-Cher), France. Thomas Wilson.)

Fig. 12. Flint Hammerstone.
(Cat. No. 99876, U.S.N.M. Grand Pressigny (Indre-et-Loire), France. Thomas Wilson.)

Fig. 13. Flint Arrowpoint.
(Cat. No. 136586, U.S.N.M. Abruzzo, Italy. Thomas Wilson.)

Fig. 14. Flint Flake or Knife.
(Cat. No. 35161, U.S.N.M. Grand Pressigny (Indre-et-Loire), France. G. L. Feuardent.)



FLINT OBJECTS FROM PREHISTORIC WORKSHOPS.

Grand Pressigny (Indre-et-Loire), France, and other localities in Europe.

of the earlier objects of bronze, showing that while these implements belonged to the Neolithic age, from their beauty and renown they continued in use into the Bronze age.

Mur-de-Barrez (Aveyron), France.—M. E. Cartailhac, of Toulouse, one of the best known archæologists in France, and M. Marcellin Boule, geologist, discovered at Mur-de-Barrez (Aveyron), central France, a mine of flint which had been worked in prehistoric times; and M. Cartailhac made a large plaster representation thereof, which was in the central hall of the anthropological section of the World's Fair held in Paris in 1889. Along with it were displayed the original objects of human workmanship, such as tools, implements, fragments, flakes, nuclei, and hammers, found in these mines and used by prehistoric man.

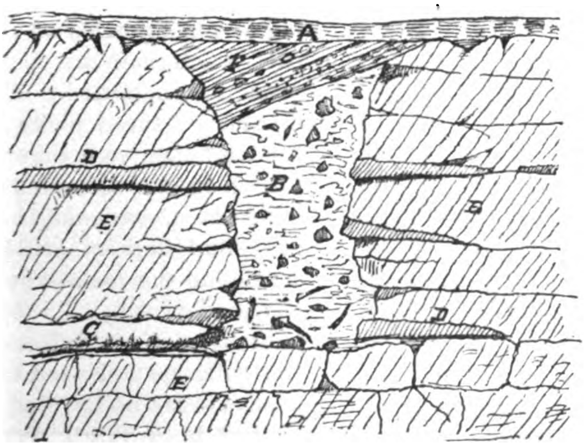


Fig. 54.

SECTION OF PREHISTORIC FLINT MINE OR PIT.

Mur-de-Barrez (Aveyron).

MM. M. Boule and E. Cartailhac, La France préhistorique, p. 138, fig. 51.

A, vegetable earth; *B*, pit excavated in prehistoric times, afterwards filled with débris containing unfinished and broken implements and flakes and chips; *C*, subterranean galleries opened by prehistoric miners following the strata of flint; *D*, stratum containing nodules of of flint; *E*, solid limestone rock; *F*, natural or accidental filling.

Fig. 55.

PREHISTORIC DEER-HORN HAMMER AND PICK COMBINED.

From flint mine at Mur-de-Barrez (Aveyron), France. ½ natural size.

La France préhistorique, p. 138, fig. 52.

It made an interesting display and gave one a thorough understanding of the subject. It was substantially a repetition in detail of the mine at Spiennes. The geologic formation was Miocene. The flint was laid down in horizontal strata after the same fashion as at Flint Ridge, Ohio. As at Flint Ridge, the prehistoric man here dug a series of pits or wells passing through the various strata, not always vertical, but at an angle, rejecting the poorer qualities of flint, one after the other, until he should arrive at the most desirable.

M. Cartailhac[1] shows the working of these mines. He says galleries were carried in all directions irregularly. At the point where the flint was most plentiful and where they were to be engaged for the longest time, they left certain portions of the earth to serve as pillars of support, as is done in coal mines at the present day. The prehistoric miners took great precaution against accidents; they filled all cavities and interstices after they had taken out the flint, to the end that there should be no caving, but there were no traces of shoring up with timbers.

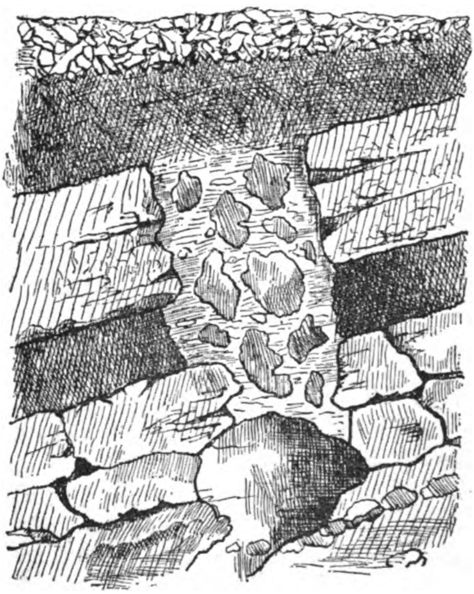


Fig. 56.

SECTION OF PREHISTORIC FLINT MINE.

Meudon (Oise), France.

Discovered in 1822 by Cuvier, wherein he found a deer-horn pick.

La France prehistorique, p. 139, fig. 53.

Notwithstanding all this care, Boule and Cartailhac found evidences of caving; for example, the implements of deer horn were found crushed by the falling of some portion of the roof which had not been properly supported. The strokes of these picks of the workmen were plainly visible on the walls of the galleries. Occasionally one could find the points still incrusted in the rocks where they had broken off. The miners had kindled fires in the galleries and used the heat to break up the blocks of flint to facilitate their extraction and transport. Some of them bore evidence of the cords and strings which had been used in carrying them. These prehistoric mines were brought to view by the opening of a limestone quarry. The mine is shown in fig. 54, and one of the deer-horn picks is represented in fig. 55.

Meudon (*Oise*), *France.*—Fig. 56 represents a similar mine from Meudon reported by Cuvier, and figured by him and Brogniart in 1822.[2] The interest to him was the deer horn found therein; the interest to us is that it was the work of man at a period to which Cuvier had refused his belief upon a-priori theory.

Champignolles (*Oise*), *France.*—A prehistoric mine of flint was discovered by Fouju and Bessin in October, 1890, and described in 1891.[3]

[1] La France prehistorique, p. 138, figs. 50–52.

[2] Idem, p. 139.

[3] L'Anthropologie, II, 1891, p. 445.

It is cited here to show how these discoveries of mines, quarries, and workshops are being continued. If more earnest search were made, more mines and workshops would be discovered. It has come to be a canon in archæologic law, recognized in France, that the evidences of prehistoric man are to be found, not in proportion as they exist, but in proportion to the number and activity of the seekers. The nodules of flint at Champignolles were in the chalk and were mined and worked into implements. Twelve pits were found, of which nine were excavated and exposed. A section is given (fig. 57) which will sufficiently explain its condition.

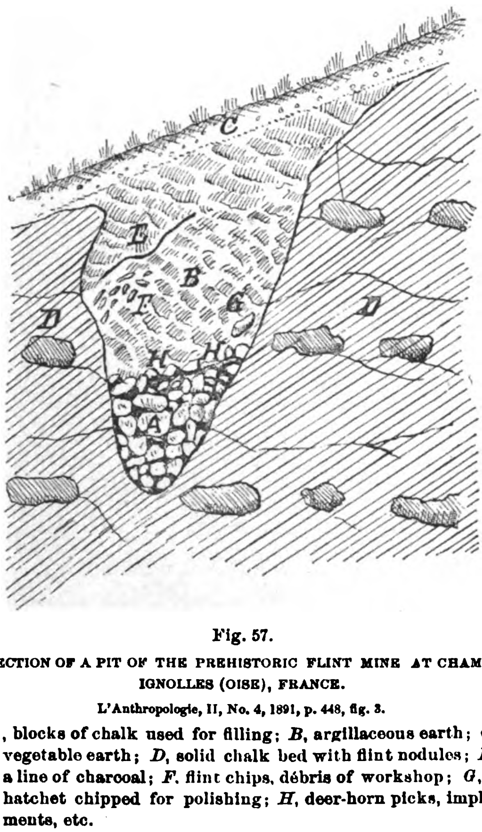


Fig. 57.

SECTION OF A PIT OF THE PREHISTORIC FLINT MINE AT CHAMPIGNOLLES (OISE), FRANCE.

L'Anthropologie, II, No. 4, 1891, p. 448, fig. 3.

A, blocks of chalk used for filling; *B*, argillaceous earth; *C*, vegetable earth; *D*, solid chalk bed with flint nodules; *E*, a line of charcoal; *F*. flint chips, débris of workshop; *G*, a hatchet chipped for polishing; *H*, deer-horn picks, implements, etc.

Scale: 1 inch equals 6 feet.

Grimes Graves, Brandon, Suffolk, England.—These are flint mines or quarries, celebrated under the ancient name of Grimes Graves and in modern times under the name of Brandon. They have been worked for hundreds of years to make gunflints and strike-a-lights. There are similar manufactories in many places in Europe. Besides Brandon, flints are made at Ichlington, Suffolk, at Norwich and Salisbury, England; at Meusnes, in France, and at Cero, Italy. In former times the business was of such importance that in France exportation of the products of certain mines was prohibited by law. In the later days the demand has fallen away so as to have become insignificant, yet Brandon leads the world. The strike-a-lights are continued in use by peasants and laborers, and by explorers and travelers in semicivilized countries. Sir John Evans visited Brandon in 1866 and Mr. James Wyatt in 1870, both of whom have described the mines.[1] At those periods there were twenty or thirty persons engaged in the business. The raw material costs, for mining, royalty, cartage, etc., about $2.50 a ton, and manu-

[1] Ancient Stone Implements, p. 14; Flint Chips, p. 578.

factured flints sold at about $1 a thousand. The price the author paid for strike-a-lights in Bologna was 1 cent apiece. In Paris the flint was arranged with steel and cotton soaked in some chemical, possibly saltpeter or chloride of potash, for tinder, the complete article costing 60 cents (fig. 58). The gunflints of commerce were divided into 23 classes, according to size and shape as they were required for different arms. In the palmy days of the flint makers they were packed for export in half barrels, each containing 2,000 musket, 3,000 carbine, or 4,000 pistol flints, the weight of each being about the same, 65 to 70 pounds. Their manufacture required some skill and handicraft, although it is soon acquired. There is great difference reported in the rapidity of the workmen.

The working of the Brandon flint mines has continued into modern times for the manufacture of gunflints. The process of making them has been described at length in various works.[1] It will be sufficiently

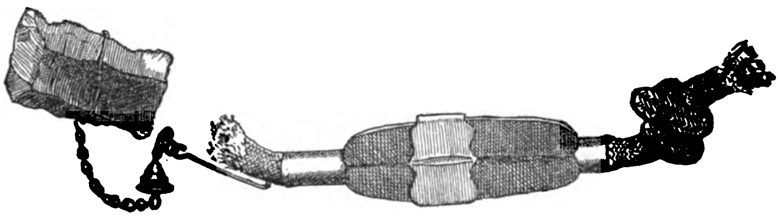


Fig. 58.

"STRIKE-A-LIGHT," STEEL AND TINDER, USED BY FRENCH PEASANTS.

Paris, France.

Cat. No. 129693, U.S.N.M.

understood by Plates 8–10, which show the principal operations. Sir John Evans says skilled workmen at Brandon could make from 16,000 to 18,000 a week, and that the average weekly output was from 200,000 to 250,000 for 20 men. In Rees's Encyclopedia,[2] it is estimated that one a minute was the average for a good workman. That would make the extreme weekly product of 20 men but 72,000.

The U. S. National Museum possesses a series of nodules, crudely and partly worked, from Brandon, showing the entire operation.

The Grimes Graves quarry was investigated by Canon Greenwell, of Durham Cathedral, in 1870, and his report is published in the Transactions of the Ethnological Society for that year (p. 419).

The quarry covered about 20 acres and consisted of shafts or pits partly filled, now forming funnel-like depressions, 254 in number, 20 to 60 feet in diameter, dispersed over the surface but sometimes so close together as to break into one another. It required much work to reexcavate them. The shafts or pits chosen by him were about 30

[1] Evans, Ancient Stone Implements, p. 18; Stevens, Flint Chips, p. 578; Rees's Encyclopedia, article "Gunflints," and Skertchly, Manufacture of Gunflints.

[2] Article "Gunflints."

FLINT KNAPPER ENGAGED IN QUARTERING FLINT.

(Observe hammers, pad on knee of operator, flints lying about, old iron lantern and hanging iron candle-stick.)

Brandon, Suffolk, England.

FLINT KNAPPER FLAKING THE FLINTS INTO LONG SLIPS.

(Observe hammers, tub of flakes, flint chips, iron flint pick and its neolithic deer-horn original.)

Brandon, Suffolk, England.

KNAPPING THE FLAKES INTO GUN FLINTS.

(Observe hammer, the blocks, cans of assorted gunflints, manner of holding and striking the flake, waste chips of flint, etc.)

Brandon, Suffolk, England.

feet in diameter at the surface, 13 feet at the bottom, and originally about 40 feet deep. Similar pits or funnel-shaped depressions abound

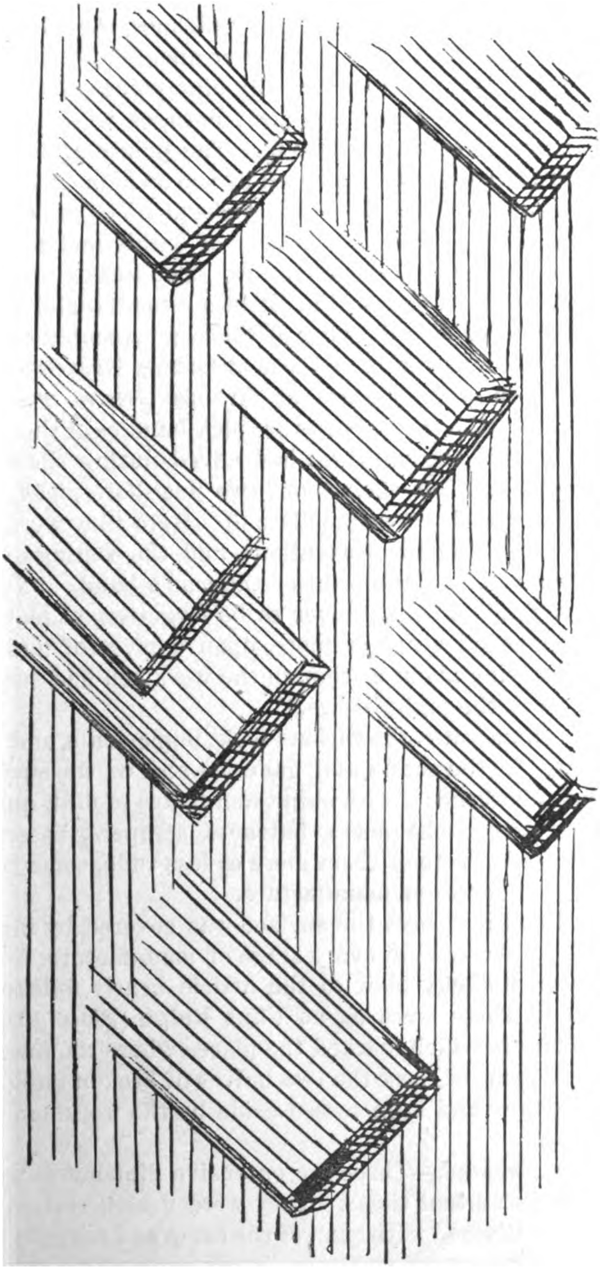


Fig. 59.

PREHISTORIC PICK MARKS IN THE HARD CLAY IN THE EXCAVATION OF AN ETRUSCAN TOMB.

(Del Colle Cassuccina) Chiusi, Italy. Illustrating the pick marks in the chalk at Grimes Graves, England.

at the quarry at Flint Ridge, Licking County, Ohio. As at Spiennes, the workmen passed through a stratum of flint, which was rejected as

of an inferior quality, and the pits continued until they reached the best flint in the chalk. The first surface of earth stratum was some 18 feet thick, which might account for the inability to make perpendicular walls or pits as at Spiennes. As at Spiennes, they drove horizontal galleries into the chalk which here were about 3½ feet high. At Spiennes, the digging tools were principally flint points (Plate 5, figs. 7, 8, 9) and flakes; here they were red deer horn, of which about 80 were found by Canon Greenwell (Plate 6). The points of these were worn as picks, and the bases were battered by use as hammers. Canon Greenwell says the marks of the deer-horn picks made by digging were yet plainly visible in the chalk. A hatchet of basalt had been thus used and made its marks at Grimes Graves. The author saw corresponding marks in the hard clay in the Etruscan tomb (del Colle Cassuccina) at Chiusi, and made a drawing of them, represented in fig. 59, which will serve as an illustration of those at Grimes Graves and elsewhere. The deer-horn pick handles at Grimes Graves were worn smooth by the hands of the workmen, as are pick handles at the present day. The roof of one of the passages had caved during the absence of the workmen, who had left their tools, two deer-horn picks, apparently at the close of the day's work (Plate 6). Here they were found by Canon Greenwell during his excavations, and the coating of chalk dust on one of them retained the print of the man's hand. "It was a most impressive sight," he said, "never to be forgotten, to look, after a lapse of three thousand years or more, upon a piece of unfinished work with the tools lying about as though the workmen had just gone to dinner or quit work the night before."[1]

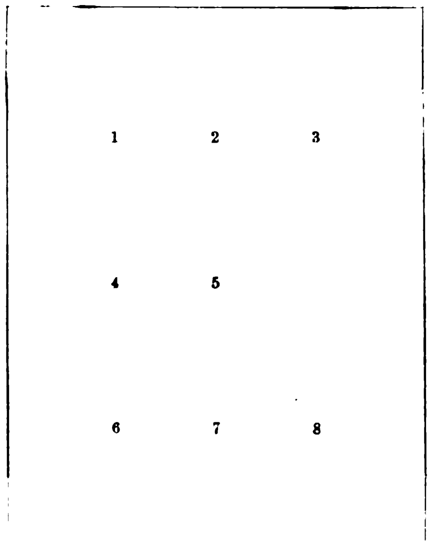
Sir John Evans enumerates the various tools, implements, and débris found in the fillings in the shafts and galleries and on the surface in the immediate neighborhood; cores, chips, and flakes of flint, quartzite and other pebbles used as hammers, hatchets, scrapers, borers, and arrow and spear heads, some of them more or less rude, some broken, and in all stages of progressive manufacture.

Prof. W. Boyd Dawkins[2] says the surface was covered by innumerable splinters and implements in every stage of manufacture, from the nodule spoilt by an unlucky blow to the article nearly finished and accidently broken. There were as at Flint Ridge (Plate 13), little heaps of small splinters which marked the places where the finer work was carried on. In some of these the two halves of broken implements were found just as they had been tossed aside by the workman (Plate 11, fig. 7; Plate 14.)

Cissbury, Sussex, England.—These are extensive flint mines worked, as were the others, in ancient times. They were first investigated in 1869 by General Pitt-Rivers.[3] His plan of the camp and mines is shown

[1] Transactions of the Ethnological Society, 1870, p. 437.
[2] Early Man in Britain, p. 279.
[3] Archæologia, XLII, pp. 44, 54.

EXPLANATION OF PLATE 11.

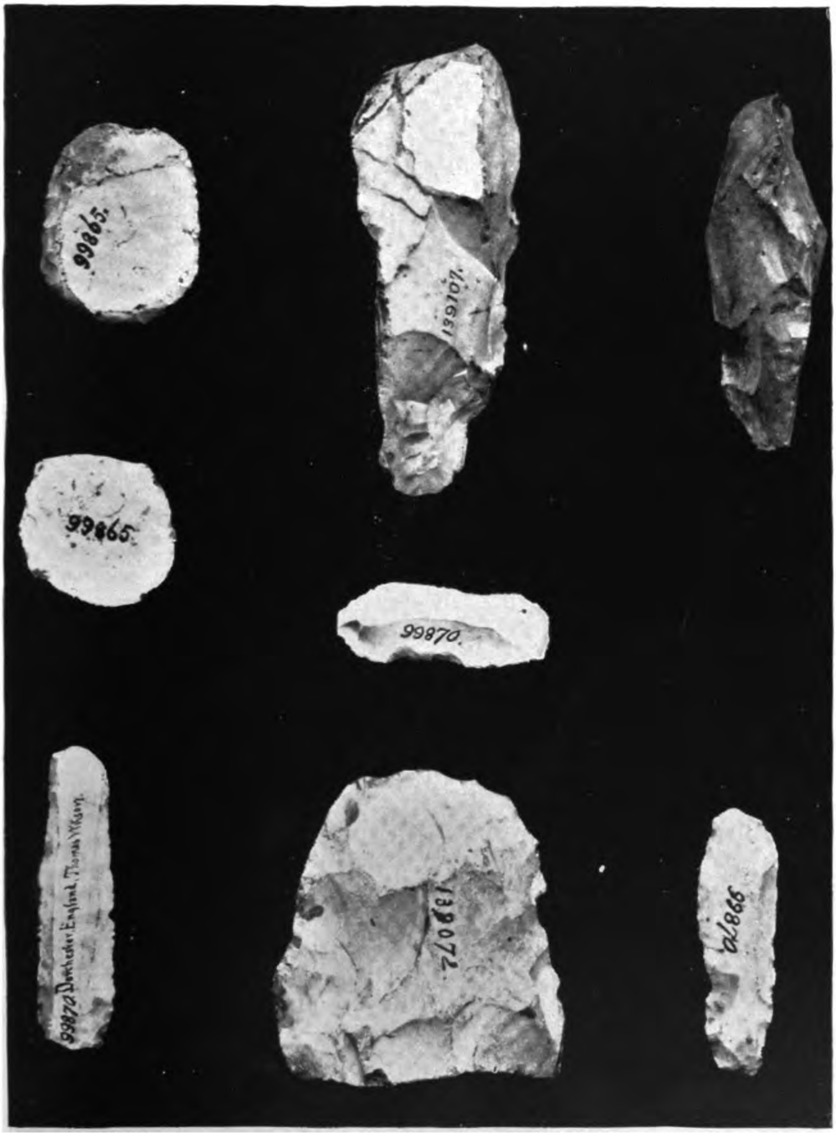


Figs. 1, 4. **Flint Scrapers.**
(Cat. No. 99885, U.S.N.M. Dorchester, England. Thomas Wilson.)

Figs. 2, 3. **Rude Flint Picks.**
(Cat. No. 139107. U.S.N.M. Prehistoric mines at Grimes Graves, Brandon, Suffolk, England. Edward Lovett.)

Figs. 5, 6, 8. **Worked Flint Flakes** (fine).
(Cat. No. 99870, U.S.N.M. Dorchester, England. Thomas Wilson.)

Fig. 7. **Rude Chipped Hatchet or Chisel.**
(Cat. No. 139072. U.S.N.M. Prehistoric mines at Grimes Graves, Brandon, Suffolk, England. Edward Lovett.)



IMPLEMENTS FROM FLINT MINES.

England.

in fig. 60. The mines were subsequently investigated more in detail and by excavation and clearing out the now filled galleries. This was done by Mr. J. Park Harrison.[1] Fig. 61 is a reproduction of the plan of his excavations. It represents but an infinitesimal portion of the mined area. It shows but six pits or shafts, while fig. 60 shows them to have existed by the hundred. These pits present on the surface much the same appearance as those at Flint Ridge. The excavations in fig. 61 show what has been suspected long before—that these pits are deep, going down through the chalk to the bottom of the flint deposit, and were thence carried in horizontal galleries as in all mining under similar

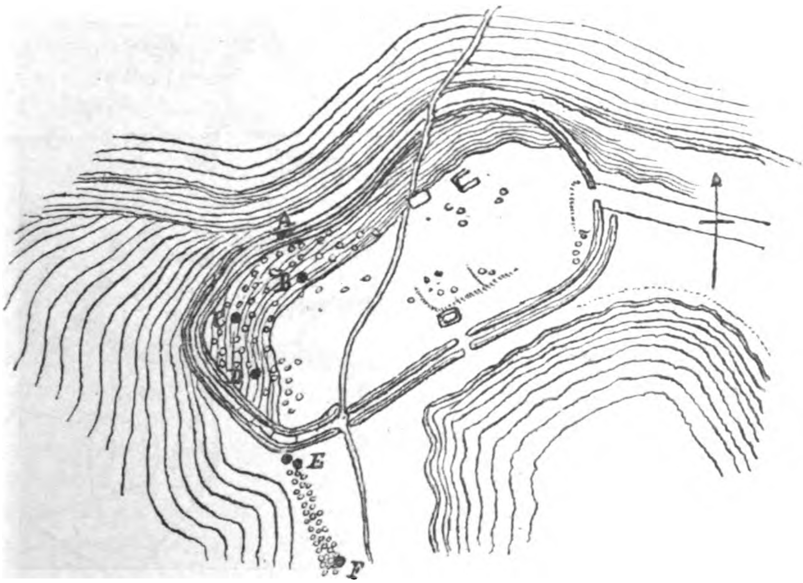


Fig. 60.

PLAN OF PREHISTORIC FLINT MINES.

A to *F* are pits or mine shafts.

Cissbury, England.

Archæologia, XLII, 1869.

conditions, digging out the flint and bringing it to the surface for use. Fig. 61 is introduced to demonstrate this fact, and also to show the extent and magnitude of the work done and to suggest the social condition of a people capable thereof. The shaded lines show the walls of the galleries left for support, while the white between shows the excavated galleries, rooms, and halls. The reexcavation brought to light not only the stratum of flint to be mined but showed that which had been mined, also the mining tools, as deer-horn picks, stone hammers, and mauls.

Only three or four out of the thousands of implements found at Cissbury bear traces of polishing, and these were broken.

[1] Journal of the Anthropological Institute of Great Britain and Ireland, VII, 1877-78, p. 413.

In all prehistoric mines and workshops throughout Europe tools and domestic utensils, flint or horn picks, chips, flakes, traces of charcoal, hammers, partially made and broken hatchets, and other implements, as sawed horn and fragments of pottery, are found (Plates 5, 7, 11),

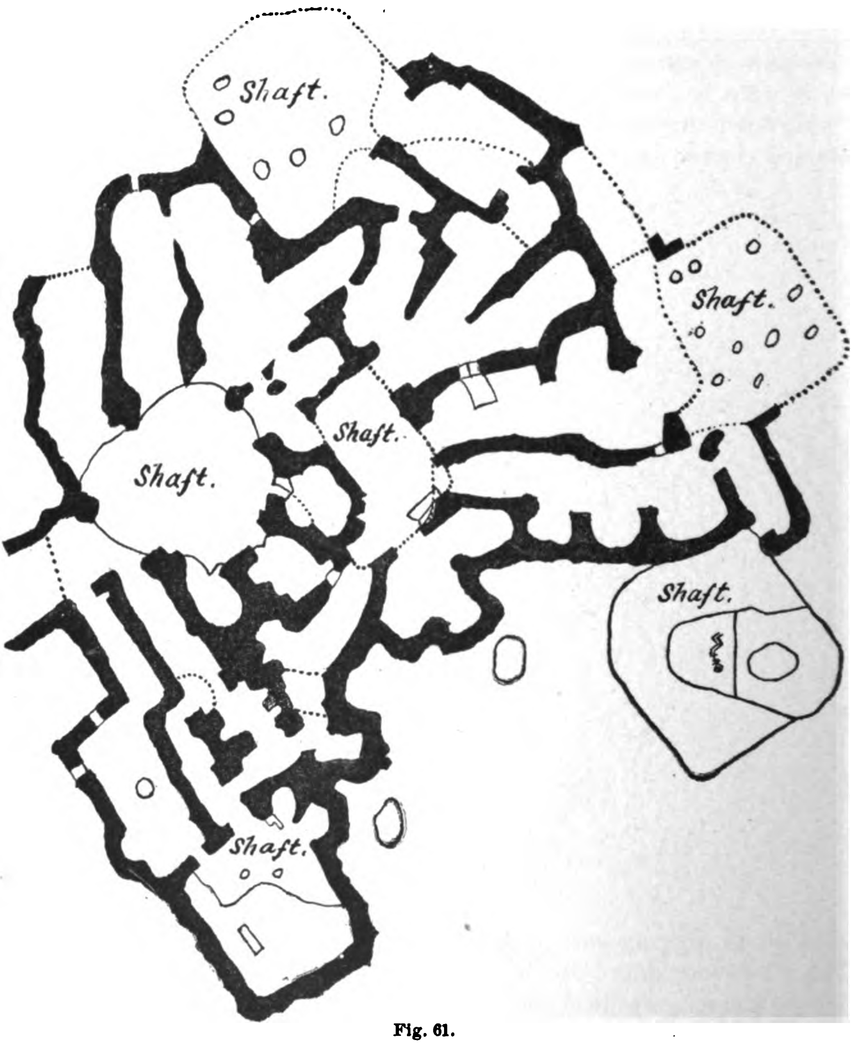


Fig. 61.

PORTION OF PLAN OF PREHISTORIC FLINT MINES.

(Enlarged and in greater detail than fig. 60.)

Cissbury, Sussex, England.

Jour. Anthrop. Inst., London, VII, 1877-78, p. 413.

and are evidences of human occupation. If man worked in one of these places for any length of time he used his tools for his work, and domestic utensils for his cooking and living, and they were broken or lost, and so found their way into the dump pile. These utensils have

come to be expected by the modern investigator, and are found wherever prehistoric man occupied the locality for any length of time.

In Rees's Encyclopedia[1] it is said that the best flint found in France in modern times is that from the departments of Cher, Loir-et-Cher, Ardêche, Yonne, and Oise. M. de Mortillet has discovered in the department of Vienne no less than 44 Neolithic workshops, and in Indre-et-Loire 9. M. Philippe Salmon reports prehistoric workshops in 14 communes in the department of Yonne. This number would undoubtedly be much increased if attention were given to the search and if all found were reported. Special workshops have been found where particular implements were exclusively manufactured. De Mortillet reports[2] hatchets chipped for polishing from Mariettes at Londinières (Seine-Inférieure), Olendon (Calvados), Forêt Othe (Yonne-et-Aube); perforators, Nemours (Seine-et-Marne); arrowheads, Camp de Chassey (Saône-et-Loire). While arrowheads are in profusion in the latter locality, it is not certain that they were manufactured there.

The following mines have been found wherein scrapers were the special product: Roche-au-Diable, Potigny (Calvados), Charenton (Seine), Camp-Barbet, Meudon, Janville, Mouy (Oise), Goalenec, Quiberon (Morbihan). Of the latter the author asks indulgence for a few words of description, as he was present with M. Gaillard and assisted at the discovery.

Scraper workshop at Goalenec, Quiberon (Morbihan), France.—It was on the extreme point of the promontory of Quiberon, on the west coast of Brittany, looking out upon the Atlantic Ocean, but which English geographers have arbitrarily called the Bay of Biscay—a high rocky point, level with the surrounding surface, but 40 or 50 feet above the water. It was severed from the mainland by a crevice a few feet in width, passable only at low tide. The entire mass was of granite rock. It was covered with a layer of soil which was nearly bare on the side toward the ocean, having probably been denuded by the waves, but on the inside edge was 3½ feet thick. Beginning at the outside edge, screening, examining, and throwing the dirt behind us, bits of broken and wrought flint and fragments of pottery were soon found. We saved everything. Our work continued across the point until we had thousands of objects, principally scrapers in all stages of manufacture. It was a prehistoric scraper workshop. The peculiarity of these scrapers was their diminutive size; many, perfectly finished, were no larger than a man's thumb nail. At the edge farthest from the ocean, where the soil was deepest, we unearthed the skeleton of a workman, a man of middle age, he who probably had made these prehistoric implements, who had here lived and here died, and had been buried in his workshop and habitation, which was from that time deserted, and now discovered and unearthed by us.

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[1] Article "Flint."

[2] Le Préhistorique Antiquité de l'Homme, p. 490.

In addition to the skeleton the following objects were found: Three polished-stone hatchets of diorite, entire; 14 hatchets, fragments, unfinished; 7 pendants of stone; 3 beads, talc; 3 chisels, hatchet (?) of diorite; 5 flakes, flint; 6 chamfered polishers, schistose diorite, unique; 1 briquet, "strike-a-light," iron pyrite;[1] 4 sinkers, scrapers in all stages of progress, many of them finished, and hammers of various kinds and styles. There were divers tools, ornaments, domestic objects, etc., not necessarily connected with scrapers or their manufacture. They were the objects used by the workmen while engaged in their duty.

The author took for his share such objects as he desired, and has had photographed a series of them (Plate 12). Observe that on the left are the finished and on the right the unfinished scrapers.

UNITED STATES.

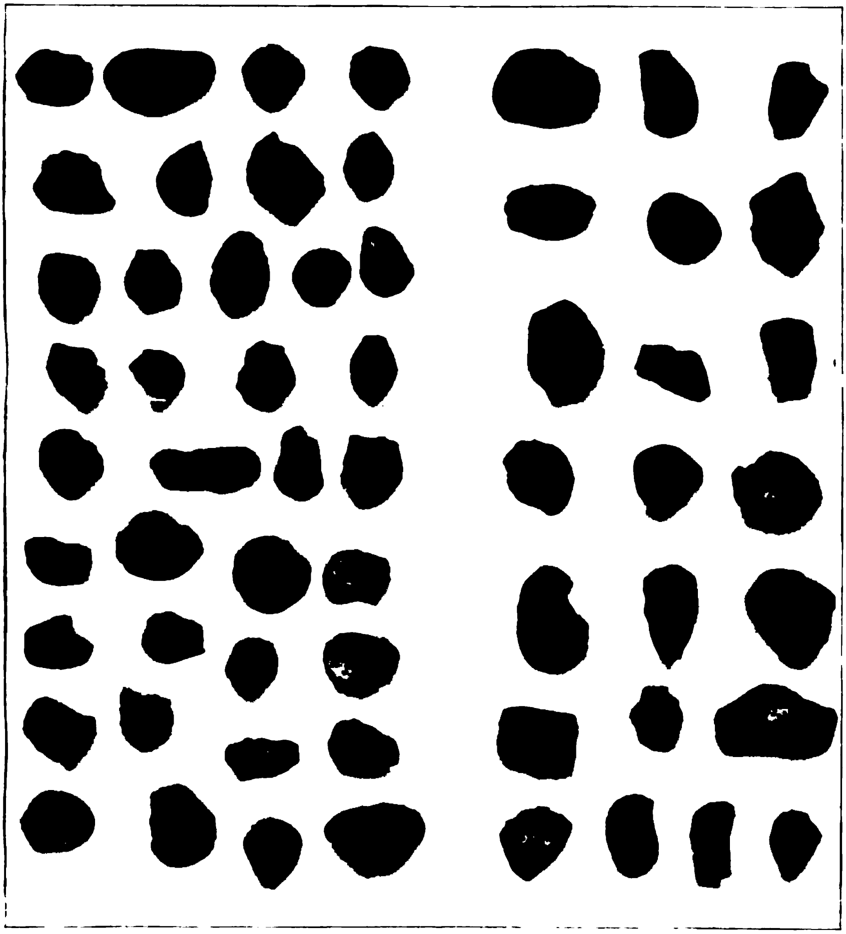
Flint Ridge, Licking County, Ohio.—This is probably the most extensive and the best known of all prehistoric flint quarries in the United States. It is on a high, level plateau on the road, equidistant between Newark, Licking County, and Zanesville, Muskingum County, Ohio, lying partly in both counties (Plate 13). Its ridge is about 8 miles east and west and 2½ north and south. The outline of the plateau is exceedingly irregular. The surface of the country has been greatly eroded, the streams having cut down about 300 feet below the original level, washing deep ravines, which run up into the plateau with steep banks, leaving high, jutting points of land. The covering earth of the plateau is alluvial—clay, shale, etc.—and lies directly on the stratum of flint. The stratum of flint dips to the southeast, as do nearly all formations in eastern Ohio, while the surface of the plateau holds about the same level. The top of the flint stratum at the western end is 3 or 4 feet beneath the surface; at the eastern it is 8 or 10 feet, and the layer itself is from 4 to 7 feet in thickness throughout the plateau.

Mr. Gerard Fowke describes the geology of Flint Ridge as follows:[2]

> In the geological scale this flint is continuous with the ferruginous limestone of southeastern Ohio, and is highly fossiliferous in some places. In the museum of the State University is a very fine nautilus embedded in a piece of buhrstone from this place. Other smaller fossils occur abundantly both in this and the more solid flint, particularly *Fusulina cylindrica*, a small foraminifer found in great numbers in Europe at a corresponding horizon. Very frequently, however, the fossil, being calcareous in its nature, has disappeared, and only the matrix remains.
>
> Underneath the flint lies the Putnam Hill limestone of the Ohio survey, so named from a high hill opposite Zanesville, where it is well shown. The upper part of this limestone is shelly, sometimes closely approaching a thin sandstone in its appearance, and of a yellow cast; farther down it becomes more solid and takes on a blue color.
>
> The flint, from its great resistance to weathering agencies, forms the cap rock of the whole ridge, the superincumbent material being for the most part either clay or

[1] Similar to fig. 223, Evans, Ancient Stone Implements.

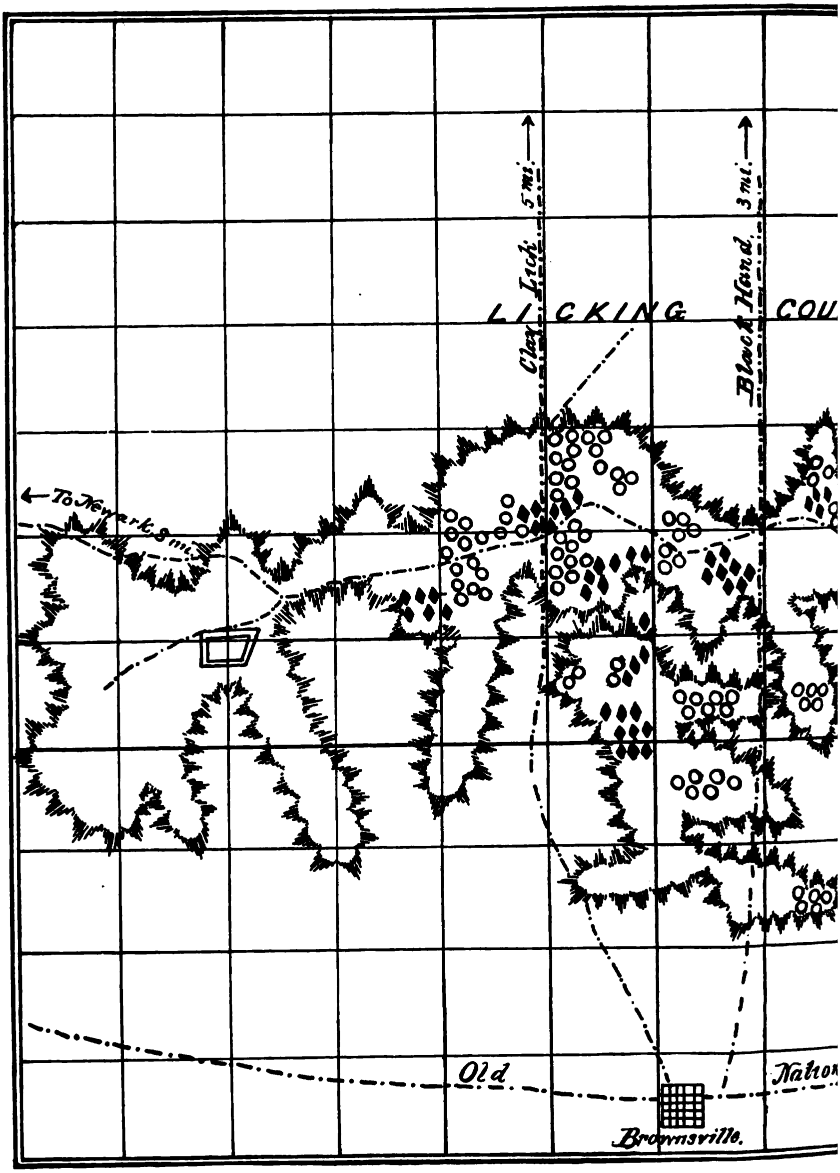
[2] Smithsonian Report, 1884, pp. 856, 857.



CACHE OF SCRAPERS.

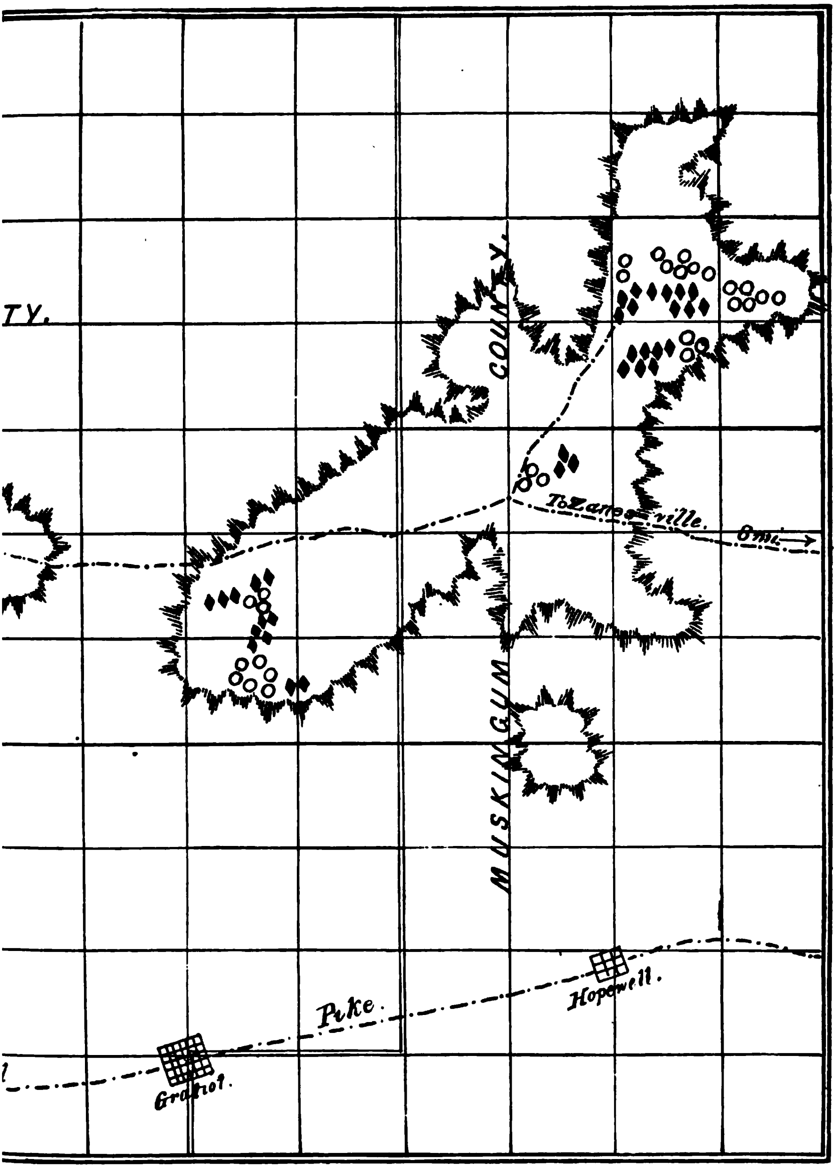
Goalenec, Brittany.

Cat. Nos. 100046, 100047, 100058, 100271, U.S.N.M.



MAP OF FLINT RIDGE, OHIO, SHOWING AB

O. Pits.



IGINAL FLINT QUARRIES AND WORKSHOPS.

Vorkshops.

soil resulting from the disintegration of the shales and sandstones which formerly existed at this horizon. The natural place of the Kittanning coal of the Pennsylvania series is 15 to 20 feet above the level of the flint, but it runs out before reaching this far west, at least there is no trace of it here. These beds of bituminous coal lie at different levels in the hills; 104 feet below the flint is a workable seam of cannel coal. A section of the formation in the eastern part of Licking County shows the same alternation of sandstone, shale, clay, coal, limestone, and iron ore that is found in all coal regions, so that a detailed statement of its geological structure is unnecessary.

Mr. Fowke describes the variations of the flint as follows:[1]

At the extreme western end it is of a gray, whitish color, cellular or porous in structure and commonly called buhrstone, and in the early occupation by white man had been quarried for use as millstones. By the oxidation of the included iron it shows shades of yellow brown along the line of fracture. Half a mile east appears the translucent and bluish variety; still the buhrstone predominates. Two miles farther east, while the bed rock retains the bluish cast, the surface specimens by weathering show every color known to flint—white, black, brown, yellow, green, and blue.

At the intersection of the crossroads, the Clay Lick Station road, the well diggers report the flint as translucent and light-blue. A few hundred yards to the north it is nearly white; the same distance south it is nearly black. These varieties are found in other parts of the plateau and finally finishes at the extreme eastern end with the same buhrstone that it commenced. In the crevices are frequently found quartz crystals. They are of every size from microscopic to that of a hen's egg, and of every color from limpidity to almost black.

The flint was found to be in a continuous stratum, not in nodules. It may have had fractures and faults, but was practically a solid mass from 3 or 4 to 7 feet thick (in one place it was only 29 inches), with an area 8 by 2½ miles. The central portion only was worked, except some scattered diggings on the east in Muskingum County. The worked area was about 2 miles square, and was covered with clay and soil to a depth of from 4 to 8 or 10 feet.

The prehistoric mining is believed by Mr. Fowke, who has examined it with great detail and thoroughness, to have been conducted in the following manner:

The clay and soil covering was removed by digging and carrying up on the level. This digging, continued down to the layer of good flint, naturally made a pit with sloping sides like an inverted cone, with its point resting on the flint layer; the point would be more or less truncated according to the width of the excavation, which was from 15 or 20 feet up to 60 or 80 feet. In some places these pits were so close that they ran together and the earlier was partially filled with the débris from the later. Many have been filled with soil, leaves, etc., and, having retained the rain water, are now filled with muck and become veritable marshes; in others the water is more or less pure and has been used for watering cattle.

The flint being laid bare in the manner indicated over a greater or

[1] Smithsonian Report, 1884, p. 857.

less area, Mr. Fowke's belief is that the prehistoric man was unable to quarry or break pieces or blocks of flint suitable for use off the solid layer at his feet, and that he proceeded by the use of fire and water alternately to erode a hole or pit through the flint. Arrived in this way at the bottom of the layer of flint, he then broke out from the face of the flint wall and threw away such pieces as had been affected by the fire, until good flint was procured, which was taken out for use. The process was continued until the quarrying was interfered with by the superincumbent earth. Why this was not excavated wider and the quarrying continued against the face of the rock, instead of what seems to have been the practice, opening a new pit through the clay, and a new hole through the flint, has not been explained; but that he conducted his operations in the latter manner and not the former seems established. Mr. Fowke says:[1]

In Coshocton County, near Warsaw, are some similar pits which have been reopened by residents of the locality. In them were found two layers of flint, the upper a dark variety, the lower a clear, translucent kind of chalcedony. This lower flint seems to have been the kind sought. Traces of fire were plainly visible in the pits, from which the inference is natural that fires were built upon the rock, and that, while heated, water was thrown on it. The stone could thus be broken into pieces. In the bottom of the pits were found bowlders of granite, syenite, and other glacial rock, which plainly showed that they had been used as hammers. No doubt a similar plan was followed at the ridge.

Similar hammers were found at Flint Ridge, and there is in the U.S. National Museum a series of a hundred or more, varying in weight from 6 ounces to 20 pounds. The smaller hammers were found distributed over the surface at the workshops where the raw material was carried to be worked into implements. Mr. Fowke is of the opinion that there were at Flint Ridge two kinds of workshops, one for the ruder work of blocking out the implements, and the other for the finishing; and he assigns this division of labor to eight localities for each, all on the plateau of the ridge. Without expressing an opinion as to the correctness of this division of workshops, the author can testify that some localities of the neighborhood were strewn with ruder and heavier material, while others had a profusion of small and fine chips, flakes, and débris, evidently the product of the finer finishing work. The latter localities were mostly on the high bluffs or points of land overlooking the valleys below, and from which position one could see far over the adjoining country. On these points the flint chips, flakes, etc., were in such profusion as, in some cases, to prevent the grass forming a sod. The author chose one of these spots and dug it out 10 by 12 inches and 14 inches deep to the bottom of all flint débris. He then washed out the earth. The flints were 7 inches deep and the earth 7 inches, half and half. The flints from this hole were brought to the U. S. National Museum. The accompanying plates (14 and 15) show

[1] Smithsonian Report, 1884, p. 864.

PLATE 14.

WORKED FLINTS FROM WORKSHOP.

Flint Ridge, Ohio.

Cat. No. 139970, U.S.N.M.

FLINT CHIPS FROM WORKSHOP.

Flint Ridge, Ohio.

Cat. No. 14998, U.S.N.M.

the number, kind, condition, and appearance. A count showed as follows:

Plate 14:	Perfect arrowheads		51
	Leaf-shaped, perfect	9	
	Leaf-shaped, imperfect	16	
			25
	Cores, finely wrought		15
	Rude lumps of flint		34
Plate 15, débris:	Hard burnt clay, small	2	
	Pebbles, not of flint, small	13	
	Bits of wood, small	5	
	Chips and spalls, flint	3,149	
			3,169
	Total contents of hole 10 by 12 by 14 inches		3,294

This quarry was the largest in that portion of the United States. The investigations show it to have been used during the later prehistoric ages and that it was the center of an extensive commerce. The peculiar appearance, variegated color, brilliancy, etc., of its products enabled their migration or commerce in prehistoric times to be traced and the objects to be recognized whenever found.

There were many mines and quarries in the territory now the United States which furnished material for aboriginal stone implements. Some of them may have continued to be used by the savages in more modern times, but most of them are entirely prehistoric. It is needless to describe them, but the reports of their discoveries have been collected and are published for the convenience of students. They form part of Appendix A (p. 961).

CACHES.

The only method possible for the savage to preserve property left behind him on his departure was to secrete it, and this was usually accomplished by burying it. This custom prevailed among the prehistoric peoples of Europe as well as of America. By what name the savage called this deposit is not known, or if known is not used. In English it has been called deposit, hoard, etc., but the most popular word is the French one of cache. It signifies concealment or hiding, and was first employed in America by the early French Canadians, the coureurs du bois, being applied to a concealed or deposited hoard or supply, usually of provisions, in which sense it is used in many of the early histories and travels in Canada and the lake regions.

In forming a cache or hoard of implements, no general or uniform method was followed, but they have been so deposited as to show intentional placement. Usually they are in a circle, and may be laid flat or on edge, sometimes on end.

Reports of caches have been made by their discoverers, and for the convenience of the student these have been collected and are published in Appendix B (p. 970).

Implements of the leaf-shaped class have been found *en cache*, or

buried in the earth, and have been called by some persons, "cache implements." M. de Mortillet names them generally Solutréen, after Solutré, the representative station of his third epoch of the Paleolithic period, but specifically he employs the name "feuille de laurier" (laurel leaf). In the classification of arrowpoints and spearheads (see p. 890) that form is assigned to Division I, Class A. Caches, as will be seen by the list (Appendix B, p. 970), are not exclusively of these implements; therefore the term cache implements is not sufficiently definite and should not be employed. Caches have been found of the large chipped flints, "spades" or "agricultural implements," arrowpoints and spearheads of different types, grooved axes, polished-stone hatchets, scrapers, and other implements.

Implements similar in material and identical in form with arrowpoints and spearheads have been found throughout the western and southwestern United States, but which, from their large size, could hardly have served for arrows or spears. An implement one to three inches long we recognize as an arrowpoint, one four to six inches long as a spearhead; but what shall we say as to one a foot or fifteen inches long? The U. S. National Museum possesses many of these specimens. They can not be ignored, and so have been assembled and reported in Appendix C (p. 982).

V. MATERIAL OF ARROWPOINTS AND SPEARHEADS.

Composition and structure—No practical difference between the flint of Europe and that of the United States—Microscopic examinations.

It has been shown that flint was the favorite material in prehistoric times for the manufacture of arrowpoints and spearheads and, indeed, for all chipped-stone implements, and was used by prehistoric man wherever obtainable. Flint, as is well known, is a variety of quartz; the principal difference so far as concerns the chemical constituents arising from the impurities. Quartz, also much used in prehistoric times in the manufacture of arrowpoints, is pure silica. It is SiO_2= silicon 46.67, oxygen 53.33. Its hardness is 7 in the scale of 10, and specific gravity 2.6 to 2.7. James D. Dana[1] divides quartz into two varieties, vitreous and cryptocrystalline. He divides the latter into the chalcedonic and jaspery varieties. The vitreous is distinguished by its glassy fracture, and the chalcedonic has a subvitreous or waxy luster and is translucent. These owe their peculiarities either to crystallization, mode of fabrication, or impurities. The common impurities of quartz, Dana says, are oxides of iron, clay, chlorite, or other minerals which produce opacity.

Of the first variety, the rock crystal is the representative. It is pure pellucid quartz. But such varieties as rose quartz, smoky quartz, false topaz, and amethyst are produced in one or more of the ways

[1] Manual of Geology, 1876, p. 52. Manual of Mineralogy and Lithology, 1886, p. 234.

mentioned. The chalcedonic variety includes the finer and more beautiful chalcedony, agate, carnelian, onyx, etc., as well as the grosser and baser variety to which belong flint, hornstone, chert, etc. The jaspery variety contains aluminous matter, and its color, yellow or red, is due to iron oxides. The bloodstone and basanite (lydian stone) belong to this.

Flint, free from impurities, has the same chemical composition as quartz, silicon combined with oxygen—silica.

Differences may arise in crystallization. Flint is of cryptocrystalline structure. Its color may be gray, shading through yellow, green, blue, and smoky black, or with tints of red, yellow, and brown, into chalcedony. Its fracture is conchoidal, not splintery, internal surface dull, scarcely ever glistening. Alone it is infusible before the blowpipe, but loses its color and becomes opaque. It is homogenous, has no cleavage, splits in any direction, therefore is easy to chip, yet is hard and tough and makes a keen cutting edge which does not crumble. It was the material best suited to the cutting implements of the prehistoric man and was preferred by him accordingly.

It is deemed useless to make analyses, because the only differences would be the number and amount of impurities, and these might differ with every locality if not with every specimen.

Rees's Encyclopedia[1] gives analyses of particular specimens as follows:

Constituents.	Klaproth.	Vaquelin.	Weigleb.
Silica	98.00	97.00	80.00
Lime	0.50	....	2.00
Alumina	0.25	1.00	18.00
Oxide of iron	0.25		....
Loss	1.00	2.00	....
Total	100	100	100

These are ancient analyses and are only given as samples. Their correctness is not verified.[2]

It has been stated many times by archæologic students and teachers that there was no true flint in the United States. But this is due to a difference of definition rather than of material. The flint of Europe, declared to be true flint, is represented as a concretionary deposit of

[1] Article "Flint."

[2] The attention of the student of this and related subjects is directed to some of the standard works: Nillson, "The Stone Age," 1843-1867; Stevens, "Flint Chips," 1870; Evans, "Ancient Stone Implements of Great Britain," 1872, 1899; S. J. Mackie, "Geologist," 1861, IV, pp. 26-29; T. McKenny Hughes, Proceedings Soc. Antiq., London, 2d ser., IV, p. 94; Geological and Natural History Repertory, II, May 1, 1868, No. 34, p. 126; S. J. Mackie, idem., III, p. 205, T. Baines, idem., pp. 258-262; T. McKenny Hughes, British Association, 1872, p. 189; Henry Christy, Trans. Ethnol. Soc., new ser., III, 1865, p. 362; Reliquiæ Aquitanicæ, Pt. 1, pp. 202-205.

silica, of cryptocrystalline structure, made in a bed or layer of soft chalk in the form of nodules. But it is not necessary, in order to be flint, that it be in the form of nodules nor that they be deposited in chalk; for the flint of Europe has been found in hard limestone in both nodules and strata. That found in the Jura Alps is deposited in strata in hard limestone and not in chalk. That at Spiennes was deposited in the clay both in strata and nodules. That used in the Mentone caves, of which there were wagon loads, and that along the Riviera, is in nodules and in limestone. The flint mine at Mur-de-Barrez (Aveyron) (fig. 54), opened by MM. Cartailhac and Boule, and the mine at Meudon (Oise) (fig. 56), discovered by Cuvier in 1822, confirms this view. These and other deposits, representing widely separated districts in France and others throughout Europe, show a general condition of flint deposited in strata as well as in nodules, and in limestone and clay as well as in chalk. These peculiarities of formation are paralleled in many localities of the United States. The differences in the deposit, and consequently in the formation of flint, are shown in many places throughout Europe. Some of them have been described, and if it was necessary many other localities could be mentioned.

The same is true of flint in the United States, whether it be fine under the name of chalcedony, or coarse under the names of chert and hornstone. James D. Dana says:[1]

Flint occurs in nodules in chalk: not unfrequently the nodules are in part chalcedonic. Hornstone differs from flint in being more brittle; it is often found in limestone. Chert is an impure hornstone. Limestones containing hornstone or chert are often called cherty limestones.

Flint Ridge, Ohio (Plate 13) is a locality noted for its ledge deposit of flint, while the flint disks from Ohio and Illinois (Plates 62, 63) show deposits to have been in nodules. Flint disks of the same general shape and of corresponding material have been found in several of the western States. A cache at Beardstown, Cass County, Illinois, contained 1,500 implements, arranged in horizontal layers, separated by thin strata of clay. Another deposit, of 3,500 specimens, was found in Fredericksville, Schuyler County, Illinois. The largest of such nodules in the U. S. National Museum, from a deposit in Union County, Illinois, is of ovoid form and measures 7¾ inches in length by 6½ inches in width.

The following excerpts from the report on the Pentamerous limestone of the Clinton group, by Prof. James Hall,[2] shows that flint exists both in strata and in nodules in the indicated horizon and locality:

On the Genesee River this rock outcrops on either side. In many places in Wayne and Monroe counties it contains nodules of hornstone which sometimes assume the form of chalcedony. This matter increases so much in Orleans and Niagara counties that it forms thin layers alternating with the limestone. Associated with this chert are found silicified fragments of shells and crinoidal joints. South of Modena thin,

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[1] Manual of Mineralogy and Lithology, 1886, p. 237.
[2] Geology of the Fourth District of New York, Pt. IV, 1843.

irregular layers of impure limestone with much hornstone. Same at Lockport, eastward (p. 63).

* * * * * * *

The first mineral is hornstone of the Pentamerous mass. This often passes into translucent varieties and forms little cavities lined with chalcedony (p. 67).

* * * * * * *

Thick-bedded dark or bluish-gray limestone with irregular cavities and often silicous concretions of hornstone. This is persistent over a large extent of country (p. 87).

* * * * * * *

Corniferous limestone. This rock is distinguished from the limestone below by the presence of hornstone in layers or nodules, etc. In Seneca County it is in regular courses from 6 to 18 inches thick, usually separated by layers of hornstone and sometimes embracing flattened nodules of the same, which have a surface as if from the crystallization of some mineral in the space between the two rocks.

* * * * * * *

In other localities these layers of hornstone increase in number and thickness almost to the exclusion of calcareous matter, which from weathering leaves the hornstone in jagged and irregular projecting points, and is locally called "chawed rock" (p. 162).

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On the west side of the Genesee its cherty characters are better developed than elsewhere. Between Caledonia and Leroy there are hundreds of acres literally paved with hornstone in small angular fragments or larger masses united by carbonate of lime (p. 158).

* * * * * * *

The hornstone sometimes passes into chalcedony (p. 168).

Dana[1] says:

The hornstone of the Corniferous limestone is full of microscopic plants, or protophytes, from 1-500th to 1-5000th of an inch in diameter; and with them are sponge-spicules and teeth of mollusks.

* * * * * * *

The Cretaceous limestones in Texas * * * contain hornstone distributed through them, like the flint through the Chalk of England.

The impurities in flint marked by different colors may be peculiar to certain localities. By them the products of different mines have been traced through their sometimes long voyages in the hands of their prehistoric owners. The color of the flint from Grand Pressigny, near Tours, France, is that of beeswax; that from Meudon, near Paris, is nearly white; that from Spiennes, Belgium, is light-gray; that from Italy, especially from the southern part, has the lustrous brown of jasper and chalcedony. Of that from England, Grimes Graves is light-gray, similar in appearance to that of Spiennes; Brandon is quite black; Cissbury is dark-brown, almost black, weathering out into chalky whiteness.

Of the flint from the United States, that from Illinois is light-gray, weathering out to chalky-white, while that from Flint Ridge (which does not weather white) passes through the entire range of color from the waxy luster of brilliant chalcedony to the dull opacity of degraded chert.

[1] Manual of Geology, 1876, pp. 257 and 455.

The cryptocrystalline variety of quartz comprises a considerable list of minerals: Opal, agate, chalcedony, flint, chert, hornstone, beginning with the finest and purest and graduating down according to the relative impurities and differences in mode of combination. Changes in color run through the entire spectrum, and are due principally to the presence of metallic oxides. Iron is chargeable with most of them, but green is credited by Dana to nickel, and purple to manganese. If there were no impurities or foreign matter in it, the flint would be nearly clear-white.

MICROSCOPIC EXAMINATION OF FLINT.

The author has shown that the rock called flint is found alike in America and Europe; that it occurs in the two countries in both nodules and strata, and in both is found in limestone as well as in chalk. He proposes to continue the examination by comparing the structure of the rock in the two countries, and to that end has caused to be made thin sections of the flint from several of the mines and quarries mentioned, and these subjected to microscopic inspection and description by Dr. G. P. Merrill, head curator of the department of geology in the U. S. National Museum. These sections have been enlarged by the aid of the microscope, and are shown in the photographic plates (16 to 22) duly identified, with the name, number, and locality. Accompanying them are Dr. Merrill's descriptions, while Plates 23 and 24 show the original specimens from which the thin sections were taken, appropriately marked for identification and comparison.

We have now shown that the chemical constituents, the kind of deposit, nodules and strata, in limestone and chalk, general appearance, mode of mining and of use were practically the same during prehistoric times in America and in Europe. If the microscopic examinations show the rock from both countries to be of the same cryptocrystalline structure, the principal, if not the sole difference being in the degree of purity (or, rather, impurity), the author ventures to suggest that there is nothing gained by making a distinction of names between the flint of Europe and that of the United States, and that the distinction, if made, is so finely drawn as to be impracticable for use by the archæologists who deal with the material.

These microscopic sections have been presented so that their structure can be compared and their similarity demonstrated:

Plate 16, fig. 1, represents a specimen of flint from Brandon,[1] fig. 2 is from Grimes Graves, and fig. 3 from Dorchester, all from England.

Plate 17, fig. 1, is from Havelse, Denmark; fig. 2 is from Mouy, Meudon, France, while fig. 3 is from Spiennes, Belgium.

Plate 18, fig. 1, is from Grand Pressigny, France; figs. 2 and 3 are from Flint Ridge, Licking County, Ohio.

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[1] Specimen fig. 1, on Plate 16 (flint from Brandon), is modern. All others are prehistoric, at least ancient, specimens.

EXPLANATION OF PLATE 16.

MICROSCOPIC THIN SECTIONS OF FLINT.

Fig. 1. FLINT.[1] An extremely fine-grained aggregate of chalcedonic particles. The structure is cryptocrystalline, so fine that the optical properties of the individual particles can not be determined. Throughout this cryptocrystalline base or groundmass are scattered numerous small colorless polarizing particles and occasional segregation areas of the chalcedonic material in a coarser or more granular condition. Beyond this, the microscope shows only minute amorphous yellowish and black particles which are presumably ferruginous and carbonaceous matter. Organic remains (sponge, spicula, and diatoms) were not specially sought for, but we find an occasional form in outline suggestive of a chalcedonic cast of the shell of a foraminifera. Section nearly colorless.

(Cat. No. 139130. U.S.N.M. Brandon, England. Plate 24, fig. 7.)

Fig. 2. FLINT. Substantially the same as Cat. No. 139130, with the exception that the section shows a greater number of the spherical areas of radiating particles of chalcedonic quartz. No forms observed that can be identified with certainty as foraminifera.

(Cat. No. 139112, U.S.N.M. Grimes Graves, England. Plate 23, fig. 1.)

Fig. 3. FLINT. For all the microscope discloses, this might be a section from specimen Cat. No. 139112, from Grimes Graves. This specimen was found by the author in a prehistoric workshop at Dorchester, Dorsetshire, England, and came from one of the neighboring flint mines.

(Cat. No. 99866, U.S.N.M. Dorchester, England. Plate 23, fig. 7.)

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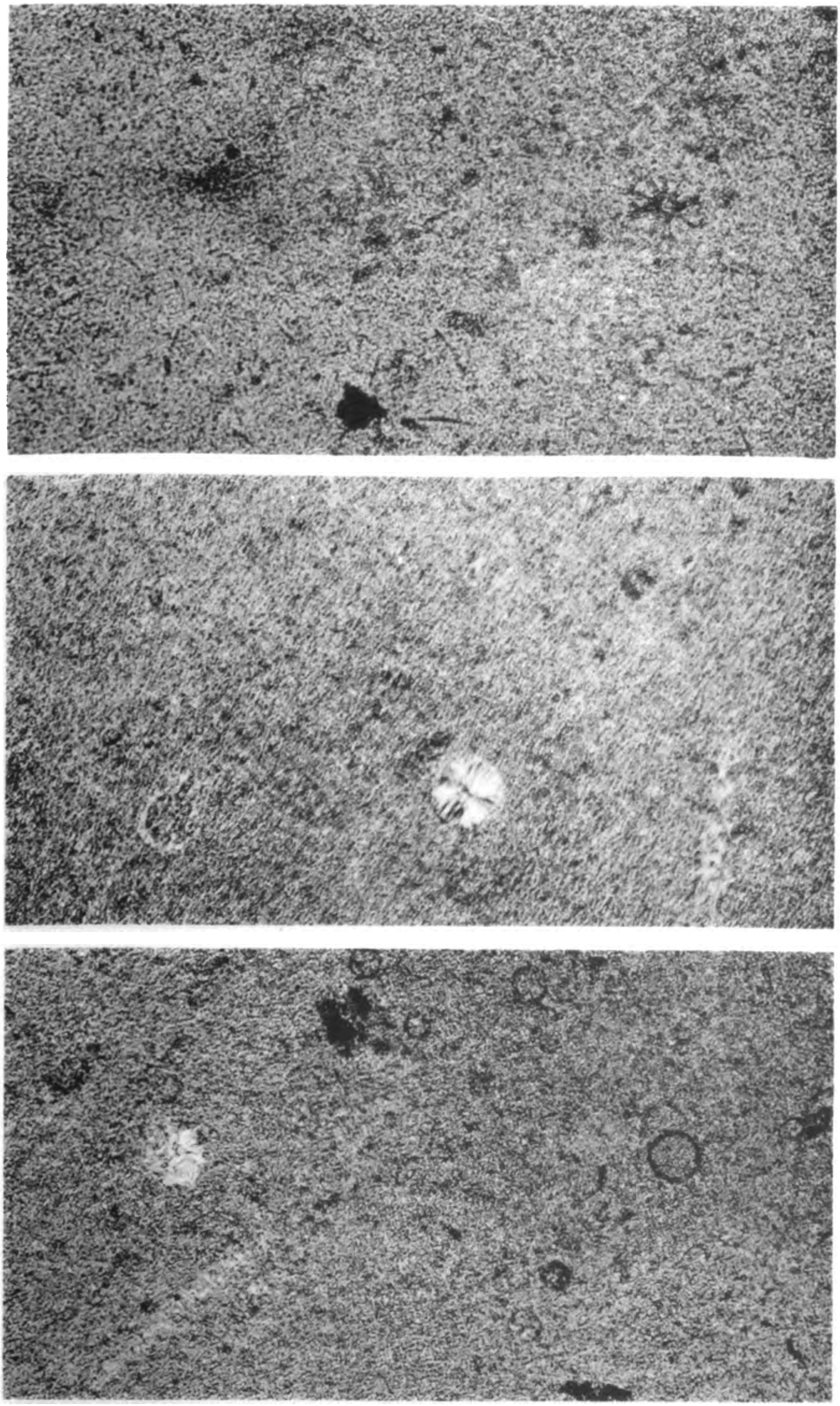
[1] Mineralogical descriptions by Dr. G. P. Merrill, U. S. National Museum.



MICROSCOPIC THIN SECTIONS OF FLINT.
England.

EXPLANATION OF PLATE 17.

MICROSCOPIC THIN SECTIONS OF FLINT.

Fig. 1. FLINT.[1] In every way essentially similar to Cat. No. 139130. The segregation areas show the chalcedonic particles more distinctly in the fan-shaped or radiating forms characteristic of the mineral.
(Cat. No. 101057, U.S.N.M. Havelse, Denmark. Plate 24, fig. 9.)

Fig. 2. FLINT. Slightly less uniform in structure than Cat. No. 99866, but otherwise essentially the same. These gregations of coarser particles are in the form of irregular strings and spots, rather than in oval areas as in the other specimens.
(Cat. No. 100138, U.S.N.M. Camp Barbet, Mouy, Meudon, France. Plate 23, figs. 9, 10.)

Fig. 3. SCRAPERS. Groundmass of this rock is essentially similar to that of specimens Cat. Nos. 139130, 101057, from Brandon, England, and Havelse, Denmark, respectively. An occasional grain of quartz may be distinguishable, but the only difference of note is a large amount of black amorphous impurities with which the rock is injected. The chalcedonic forms noted in Cat. No. 139130 as suggestive of foraminifera are more abundant and so plainly defined as to leave no doubt regarding their nature.
(Cat. No. 100259, U.S.N.M. Spiennes, Belgium. Plate 23, fig. 3.)

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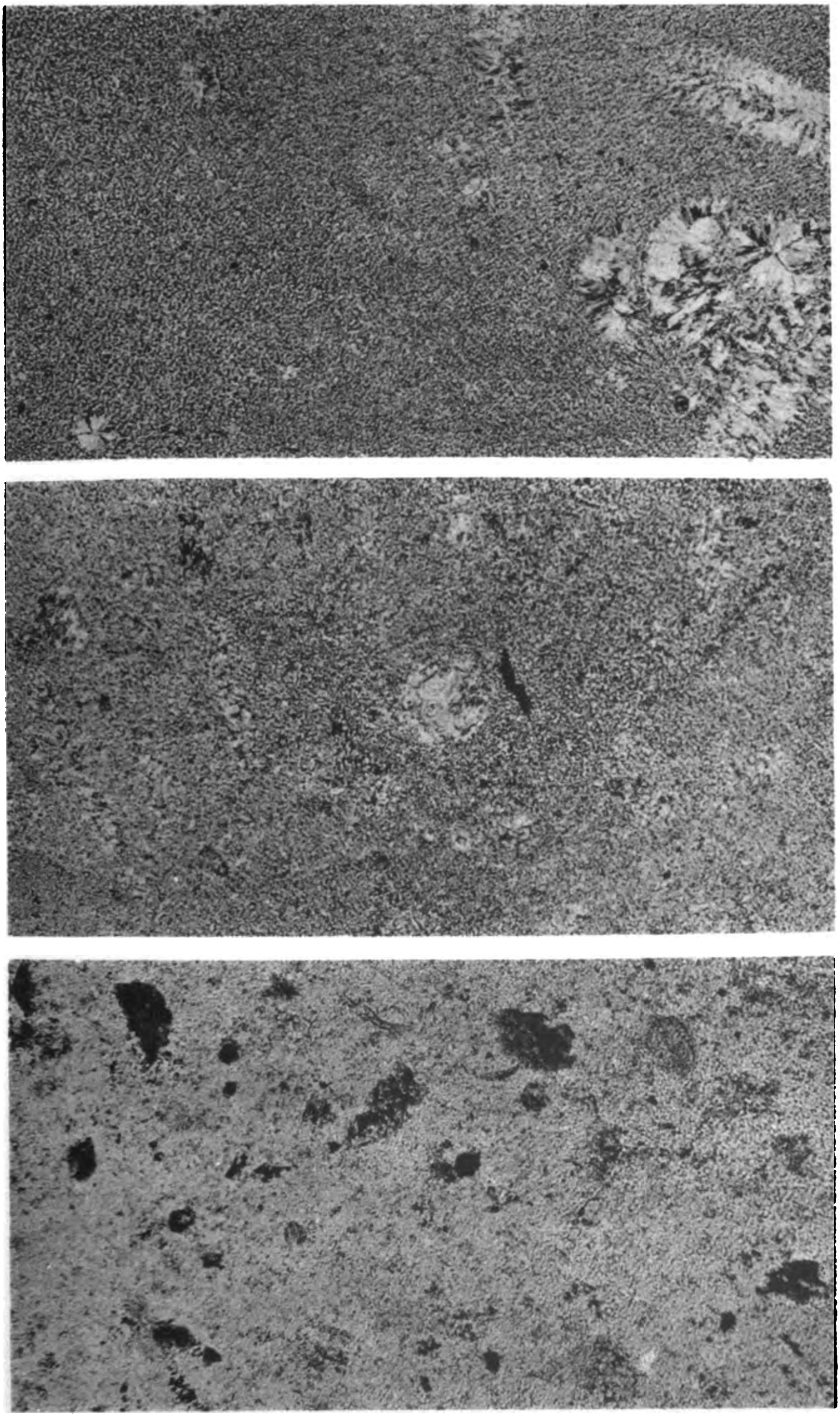
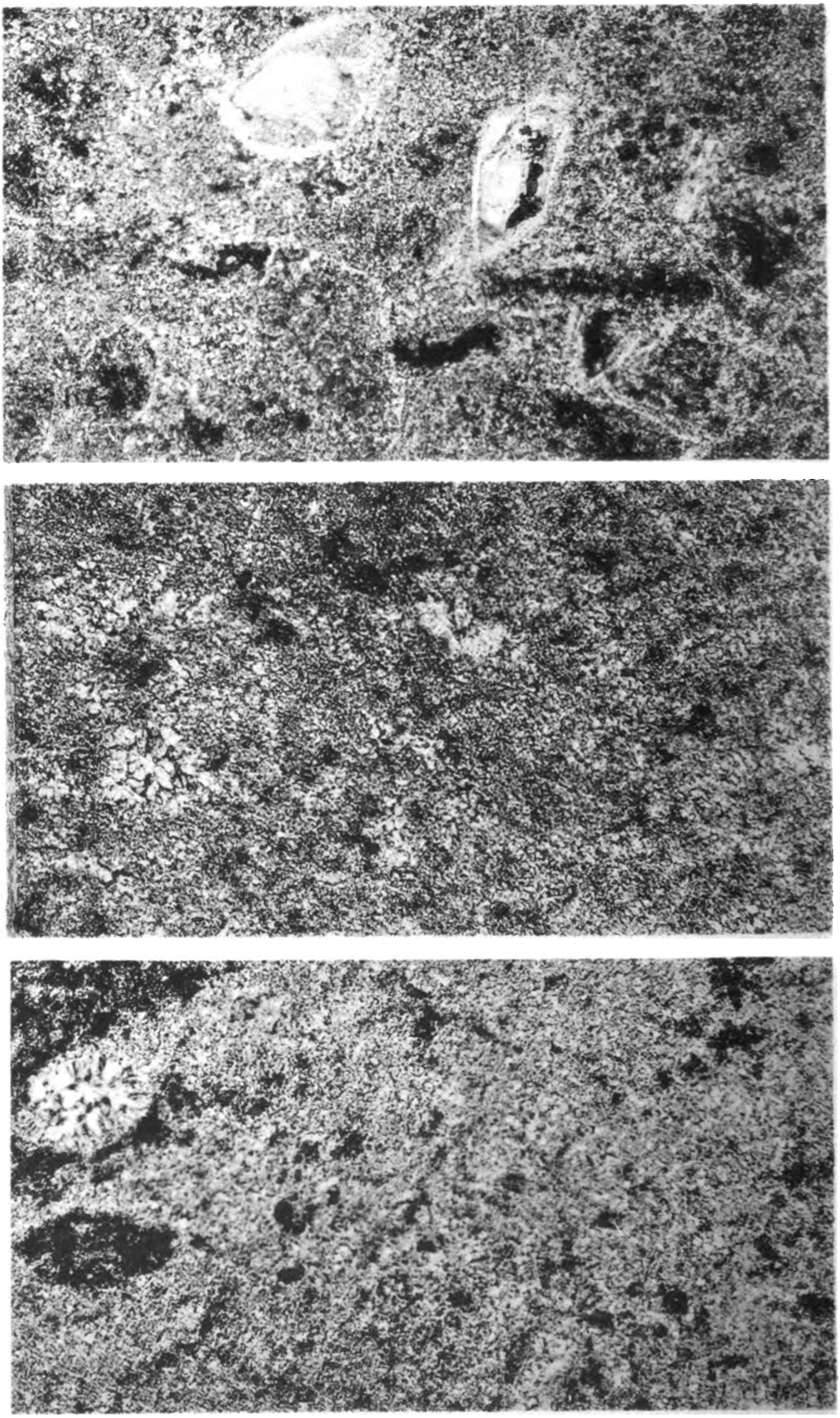
[1] Mineralogical descriptions by Dr. G. P. Merrill, U. S. National Museum.



MICROSCOPIC THIN SECTIONS OF FLINT.
Denmark, France, and Belgium.



MICROSCOPIC THIN SECTIONS OF FLINT.
France and United States.

EXPLANATION OF PLATE 18.

MICROSCOPIC THIN SECTIONS OF FLINT.

Fig. 1. FLINT.[1] This specimen differs from Cat. No. 100259, or Plate 17, fig. 3, first, in coarseness of texture, and second, in showing an abundant sprinkling of crystalline granules of quartz. The slide is made up of irregularly oval areas of chalcedonic particles, sometimes rendered almost opaque by ferruginous and carbonaceous impurities, the interstices being occupied by the material differing only in degree of purity, the carbonaceous matter being confined mainly to the oval areas, the appearance being as though the interstitial deposit was made subsequently and under more favorable conditions (as regards purity).

(Cat. No. 99908, U.S.N.M. Grand Pressigny (Indre-et-Loire), France. Plate 24, fig. 8.)

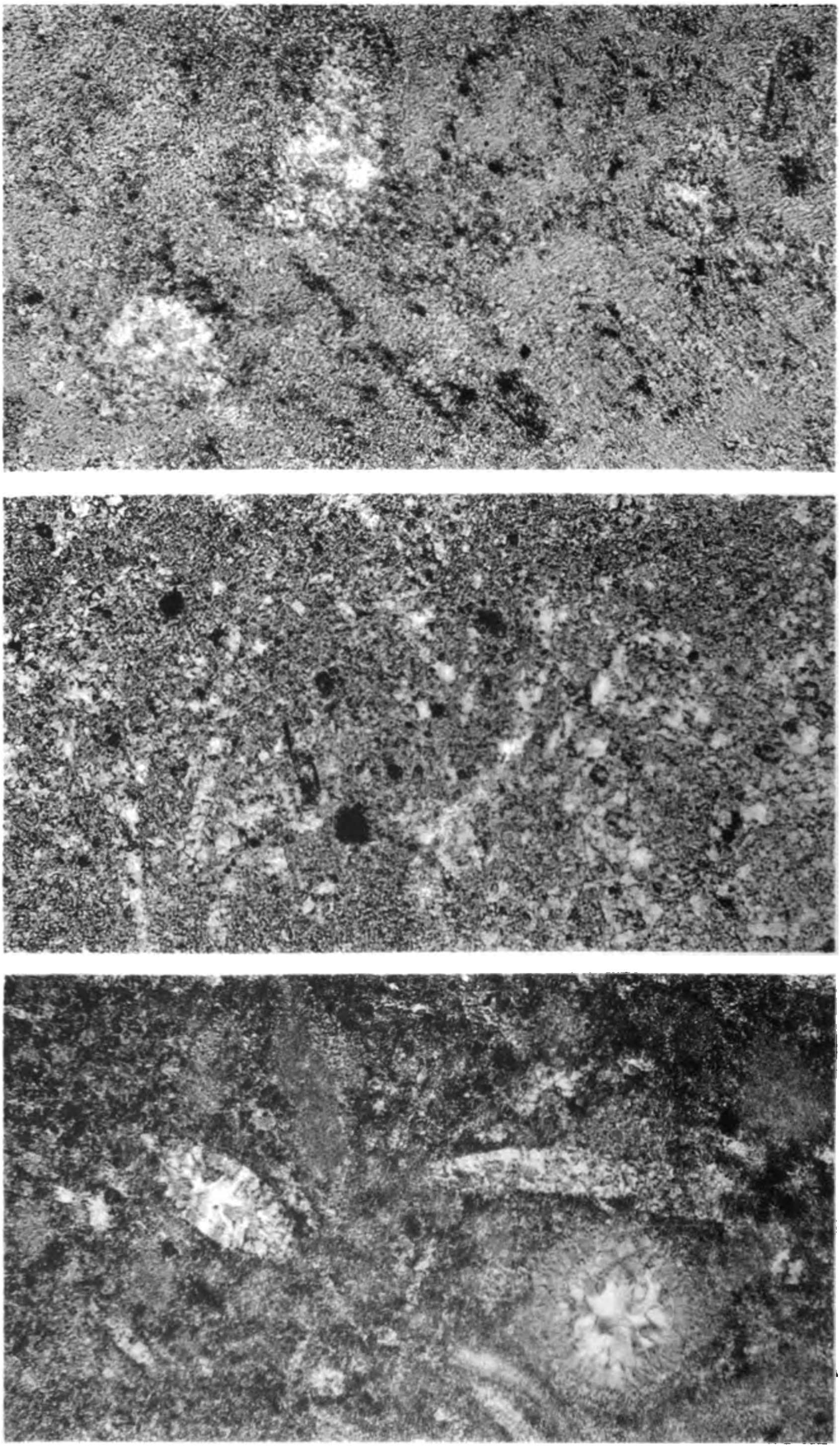
Fig. 2. PINK FLINT. This, like those from Europe, is mainly a compact cryptocrystalline mass of chalcedonic silica, with segregation areas of the same material showing the characteristic spherulitic and fan-shaped arrangement of the particles. In a few instances the slide shows small areas of granular crystalline quartz. The rock is injected with iron oxide sufficient to give it a reddish or yellowish tinge, and the foraminifera remains noted in the European specimens are quite lacking.

(Cat. No. 98344, U.S.N.M. Flint Ridge, Licking County, Ohio. Plate 24, fig. 6.)

Fig. 3. BLACK FLINT. This slide differs from the last (Cat. No. 98344) mainly in being of finer texture and in carrying an abundance of muddy and opaque carbonaceous matter which is not distributed uniformly through the mass of the rock, but occurs rather in blotches and streaks. The slide shows further numerous irregular sharply angular areas with curvilinear outlines so filled with impurities as to be of a dirty-brown color, and which are wholly without action on polarized light, indicative of silica in an opalescent form. There are numerous elongated cylindrical bodies which are without action on polarized light, which are suggestive of something of an organic nature.

(Cat. No. 98344a, U.S.N.M. Flint Ridge, Licking County, Ohio. Plate 24, fig. 4.)

[1] Mineralogical descriptions by Dr. G. P. Merrill, U. S. National Museum.



MICROSCOPIC THIN SECTIONS OF FLINT.
United States.

EXPLANATION OF PLATE 19.

MICROSCOPIC THIN SECTIONS OF FLINT.

Fig. 1. WHITE FLINT.[1] This section shows a ground of chalcedonic particles interspersed with numerous irregular areas filled with an outer zone of chalcedonic material and interstitially with calcite. The structure may be compared with amygdaloids of volcanic rocks. It shows a single shred of ferruginous mica.

(Cat. No 59726, U.S.N.M. Pike County, Illinois. Plate 23 fig. 5.)

Fig. 2. BLACK FLINT DISK. This slide differs from anything we have had, in that, while it is composed mainly of chalcedonic silica, it has, under the microscope, an almost granular aspect, and carries, moreover, a large amount of calcite. There is very little true quartz, the larger granules and cryptocrystalline portions showing the optical properties of chalcedony. The most marked characteristics of the rock is the abundance of calcite as above noted, and which occurs in the form of aggregate and minute irregular particles as fine as dust, distributed throughout the entire mass of the rock, and also in well-defined rhomboidal crystals. Nothing of organic forms is recognizable. Qualitative test shows the presence of lime, alumina, and iron, as well as silica.

(Cat. No. 15350, U.S.N.M. Cass County, Illinois. Dr. J. F. Snyder. Plate 24, fig. 5.)

Fig. 3. CHERT. A dense brownish aggregate of chalcedony and calcite, with many elongated rounded and oval areas now occupied by calcite crystals, but which are suggestive in outline of Fusulina.

(Cat. No. 26582, U.S.N.M. Kansas.)

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[1] Mineralogical descriptions by Dr. G. P. Merrill, U. S. National Museum.

Plate 19, fig. 1, is from Pike County, Illinois; fig. 2 is one of the black flint disks from Cass County, Illinois, and fig. 3 is chert from Kansas.

Plate 20, fig. 1, is from Illinois; fig. 2 from near the Chain Bridge, District of Columbia.

The author respectfully submits that these microscopic investigations demonstrate that the flint of America and that of Europe both have the same structure, that both are cryptocrystalline, that the differences are more of purity than aught else, and that if one is entitled to be called flint the other is also.

Other materials, as well as all variations of flint, were used by the prehistoric man for his implements, and as a contribution to the general subject thin sections were also made of such specimens as were convenient and satisfactory, and submitted to microscopic examination by Dr. Merrill:

Plate 20, fig. 3, is argillite from Trenton, New Jersey.

Plate 21, fig. 1, is oolitic chert from Cape May, New Jersey; fig. 2, gray chert from Missouri, and fig. 3, quartzite from Potsdam, New York.

Plate 22, fig. 1, is quartz porphyry from Norfolk, Connecticut; fig. 2, from Chain Bridge, District of Columbia; and fig. 3, diabase, from Spartanburg, South Carolina.

Plates 23 and 24 represent the specimens from which the foregoing microscopic thin sections were made.

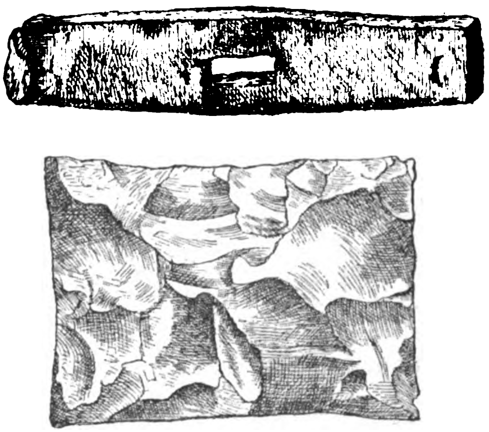
VI. MANUFACTURE OF ARROWPOINTS AND SPEARHEADS.

This subject has been treated in many essays and addresses. The Anthropological Society of Washington City, under the supervision of Dr. Otis T. Mason, devoted an evening during the season of 1891 to the subject of arrows and arrowpoints. Short addresses were delivered, papers read, and the proceedings published.[1] Dr. Holmes, Mr. Gill, and Mr. Cushing spoke on the manufacture; the author on ancient forms; Dr. Hough on arrow feathering and pointing; Colonel Flint on modern archery; Dr. Hoffman on poisoned arrows, and Capt. John G. Bourke, U. S. A., on the arrow among the Indians.

Attempts at making stone arrowpoints have resulted in some persons attaining a degree of proficiency which, being in the interest of the science, is laudable; Messrs. W. H. Holmes, Frank H. Cushing, and De Lancy Gill are experts in the making of stone arrowpoints, and the latter gave an exhibition of his skill before the Anthropological Society of Washington in 1891. Unhappily, a few persons have prosecuted it for gain and with intent to defraud, representing their objects as of genuine antiquity; when so done it is no better than forgery and should be punished as a crime.

[1] The American Anthropologist, IV, pp. 45–74.

At the Paris Exposition of 1889 Dr. Capitan displayed a series of stone implements in all stages of progress and approaching completion, together with the tools used in their manufacture. The possible method of making stone implements was discussed at the tenth session of the International Congress of Prehistoric Archæology of Paris in 1889. M. A. de Mortillet showed, with illustrations, the cracking and chipping of flint by the heat of the sun, exposure to the air, by fire, by percussion, and pressure. Dr. Capitan gave a practical demonstration of the methods employed. He used the hammer, with and without the intervention of a punch, by stroke, free hand, and on the anvil. The nucleus was the débris, while the flake was the desired product. The flake, larger or smaller, once obtained, was subjected to secondary chipping, by which it was made into the arrowpoint, spearhead, or knife, according to the intention of the maker and the possibilities of the material. This was done by percussion or striking with a hammer either with or without the intervention of a punch, while the object is held in the hand or on the knee; by pressure with a flaker, and (for other implements than arrow or spear heads) by hammering or pecking, and by grinding or polishing.[1]



Figs. 62, 63.

IRON FLAKING HAMMER AND A "STRIKE-A-LIGHT" MADE WITH IT.

Albania, Greece.

Collected by Mr. Arthur J. Evans. Jour. Anthrop. Inst., XVI, pl. 1, figs. 1-3. Natural size.

Sir John Evans interested the International Congress of Prehistoric Archæology, held in Norwich, England, in 1868, by making in its presence flint implements, both by pressure and percussion. At the meeting of the British Association in Aberdeen he showed specimens of the flint knapper's work obtained by his son, Mr. Arthur J. Evans, in the town of Joannina, in the province of Epirus, southern Albania. Mr. Arthur J. Evans had met the old workman in the streets engaged in making the strike-a-lights for market, and after seeing him work, getting samples of his wares and materials, being shown the limestone plateau from which he obtained the flint nodules, Mr. Evans purchased the entire outfit, flint, tools, and all, and they were exhibited before the association. Afterwards the paper was read before the Anthropolog-

[1] Report of International Congress, American Naturalist, XXV, November, 1891, p. 1032.

EXPLANATION OF PLATE 20.

MICROSCOPIC THIN SECTIONS OF FLINT AND OTHER ROCK.

Fig. 1. BLACK FLINT.[1] Essentially the same combination as Cat. No. 15350, from Illinois.

(W. X. Plates 19, fig. 2; 24, fig. 5.)

Fig. 2. ARGILLITE. Schistose aggregate of quartz particles and much undeterminable gray matter which might readily pass for partially metamorphosed argillitic material of a sedimantary rock.

(Cat. No. 139010, U.S.N.M. District of Columbia, vicinity of Chain Bridge. Plate 24, fig. 3.)

Fig. 3. ARGILLITE? The groundmass of this rock is made up of a gray material showing between a crossed nicol. No distinct crystalline forms, but breaking up as the stages revolve into irregular areas polarizing faintly in light and dark colors. The properties are too obscure to be of determinative value. Throughout this groundmass are scattered numerous irregular areas of quartz, of feldspars which have crystallized *in situ*, and small shreds of greenish mica. I am unable to satisfy myself regarding the petrographic nature of the rock, and can only suggest that it may be an argillaceous sedimentary which has undergone a certain amount of dynamic metamorphism.

(Cat. No. 99269, U.S.N.M. Trenton, New Jersey.)

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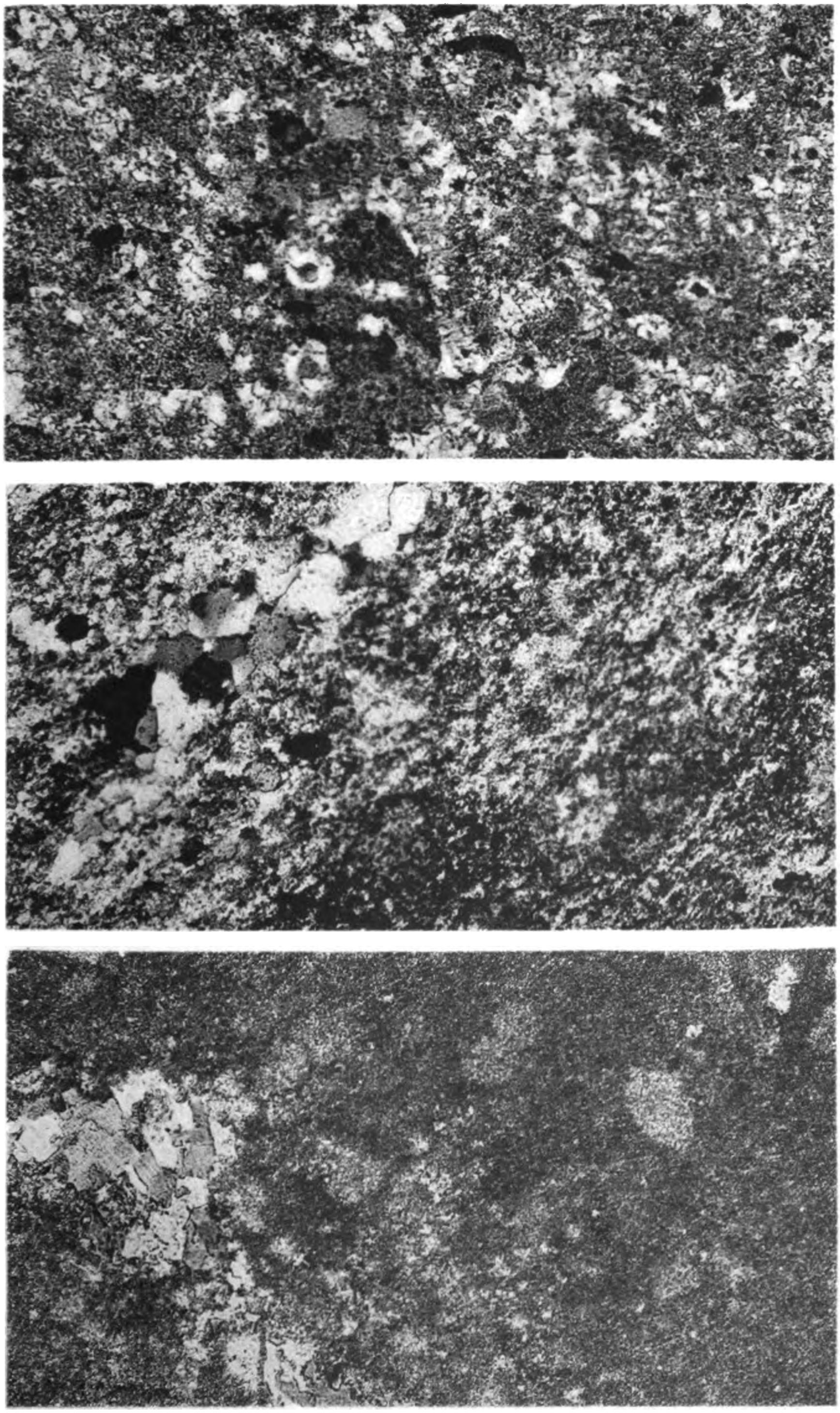
[1] Mineralogical descriptions by Dr. G. P. Merrill, U. S. National Museum.



MICROSCOPIC THIN SECTIONS OF FLINT AND OTHER ROCKS.
United States.

EXPLANATION OF PLATE 21.

MICROSCOPIC THIN SECTIONS OF FLINT AND OTHER ROCKS.

Fig. 1. OOLITIC CHERT. This is made up of rounded concretionary masses of chalcedonic silica held together by an interstitial cement, which is largely quartz in a finely granular condition, but in part chalcedony. The oolitic forms are rendered very impure by inclosures of dust-like particles and black, opaque particles of iron ore, while the interstitial material is comparatively colorless.

(Cape May, New Jersey.)

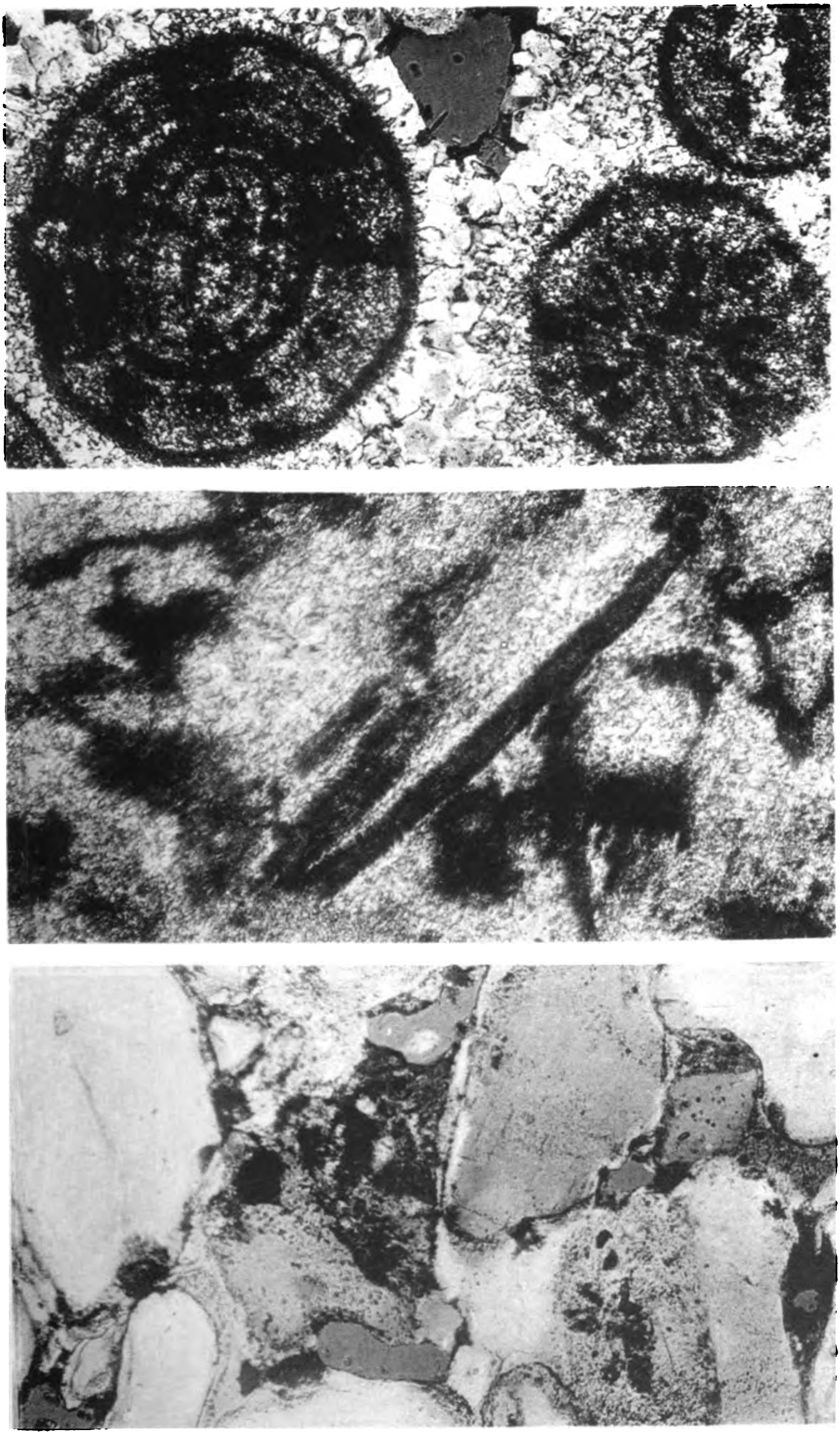
Fig. 2. GRAY CHERT. This section shows a mass of irregular rounded oval, greatly elongated and sometimes angular, areas with curvilinear outlines, of a dirty-brownish color, and which are sometimes wholly without action on polarized light and sometimes show the cryptocrystalline structure charteristic of chalcedony. These areas are interspersed with silica in the form of colorless chalcedony and granular quartz.

(Cat. No. 71607, U.S.N.M. Clark or Lewis County, Missouri. Plate 23, fig. 6.)

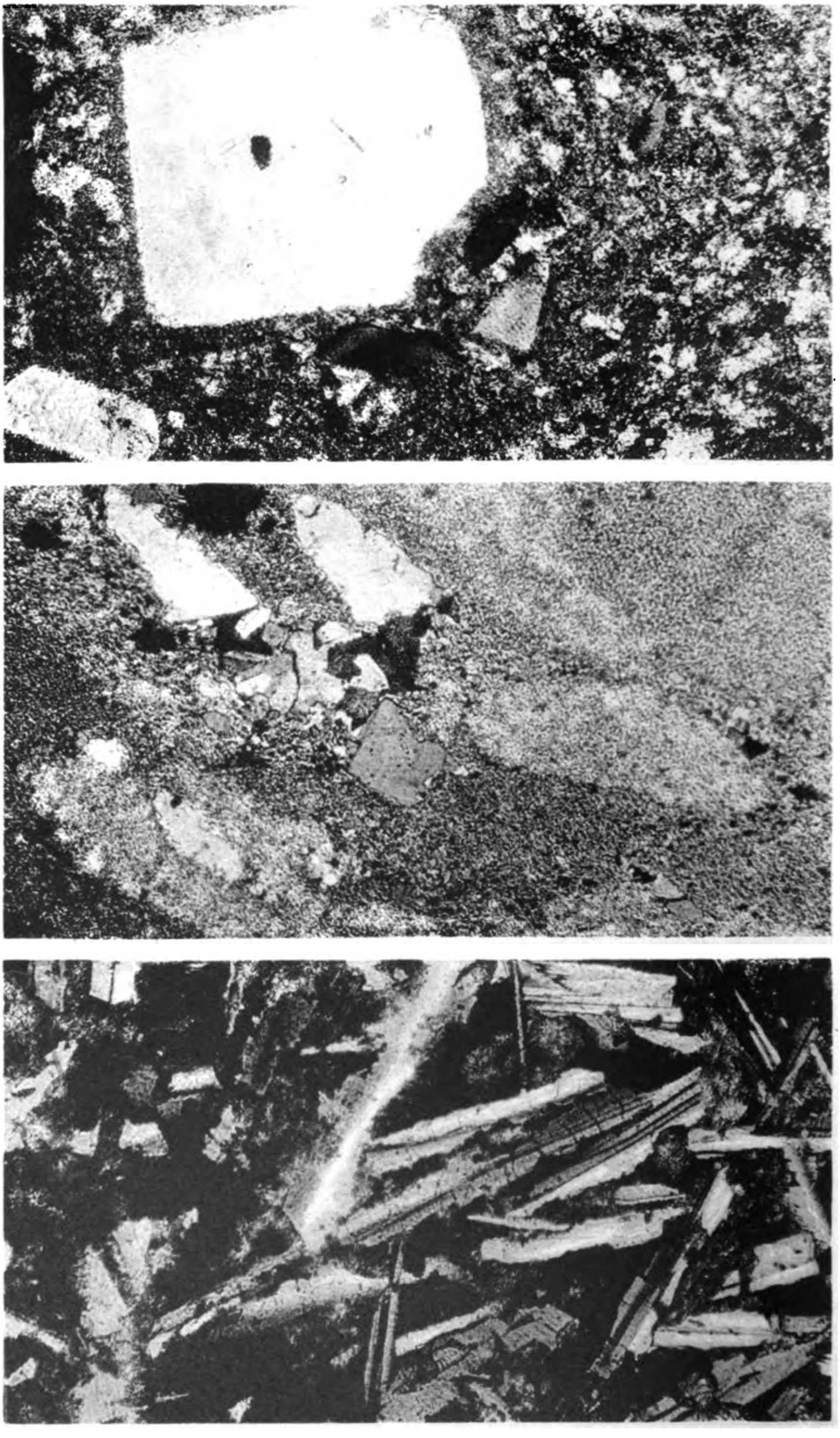
Fig. 3. QUARTZITE. An indurated siliceous sandstone, consisting of well-rounded grains of colorless quartz bound into a compact mass by a secondary disposition of interstitial silica. This secondary silica has so oriented itself with regard to the original sand grains as to convert the rock into an aggregate of imperfectly outlined quartz crystals, of which the original sand grains form the nuclei.

(Cat. No. 26268, U.S.N.M. Potsdam, New York.)

Mineralogical descriptions by Dr. G. P. Merrill, U. S. National Museum.



MICROSCOPIC THIN SECTIONS OF FLINT AND OTHER ROCKS.
United States.



MICROSCOPIC THIN SECTIONS OF ROCKS, USED FOR ABORIGINAL IMPLEMENTS.
United States.

EXPLANATION OF PLATE 22.

MICROSCOPIC THIN SECTIONS OF ROCKS, USED FOR ABORIGINAL IMPLEMENTS.

Fig. 1. QUARTZ PORPHYRY. A dense felsite groundmass, bearing abundant quartzes in both rounded and angular forms, often deeply corroded and more rarely well-defined phenocrysts. The structure is common to the quartz porphyries, but shows no appreciable flow structure. In a single instance is noted a brilliantly polarizing aggregate of the manganese epidote, piedmontite.
(Cat. No. 27861, U.S.N.M. Norfolk, Connecticut.)

Fig. 2. ARGILLITE ?. Schistose, semi-metamorphic rock, the optical properties of which are too obscure for satisfactory determination.
((C. B.) Chain Bridge, Virginia, or District of Columbia.)

Fig. 3. DIABASE This shows a wholly crystalline aggregate of elongated feldspar and augite with the characteristic ophitic structure of diabase.
(Cat. No. 16708, U.S.N.M. Spartanburg, South Carolina.)

Mineralogical descriptions by Prof. G. P. Merrill, U. S. National Museum.

SPECIMENS OF ROCK FROM WHICH THIN SECTIONS WERE MADE.

EXPLANATION OF PLATE 23.

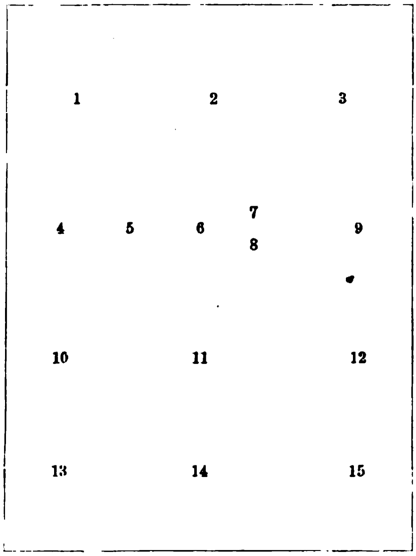


Fig. 1. RUDE FLINT IMPLEMENT.
(Cat. No. 139112, U.S.N.M. Prehistoric mines, Grimes Graves, Brandon, Suffolk, England. Edward Lovett.)

Fig. 2. FLINT FLAKE.
(Cat. No. 139078, U.S.N.M. Prehistoric mines, Cissbury, Sussex, England. Edward Lovett.)

Fig. 3. WORKED FLAKE, SCRAPER.
(Cat. No. 100259, U.S.N.M. Prehistoric mine, Spiennes, Belgium. Thomas Wilson.)

Fig. 4. RUDE FLINT IMPLEMENT.
(Cat. No. 98346, U.S.N.M. Prehistoric mine or quarry, Flint Ridge, Licking County, Ohio. Gerard Fowke.)

Fig. 5. LEAF-SHAPED IMPLEMENT OF FLINT.
(Cat. No. 59726, U.S.N.M. Mound, Pike County, Illinois. Rev. T. D. Weems.)

Fig. 6. LEAF-SHAPED IMPLEMENT OF FLINT.
(Cat. No. 71607, U.S.N.M. Clark County, Missouri. P. W. Norris.)

Fig. 7. WORKED FLINT FLAKE (neolithic).
(Cat. No. 99866, U.S.N.M. Dorchester, England. Thomas Wilson.)

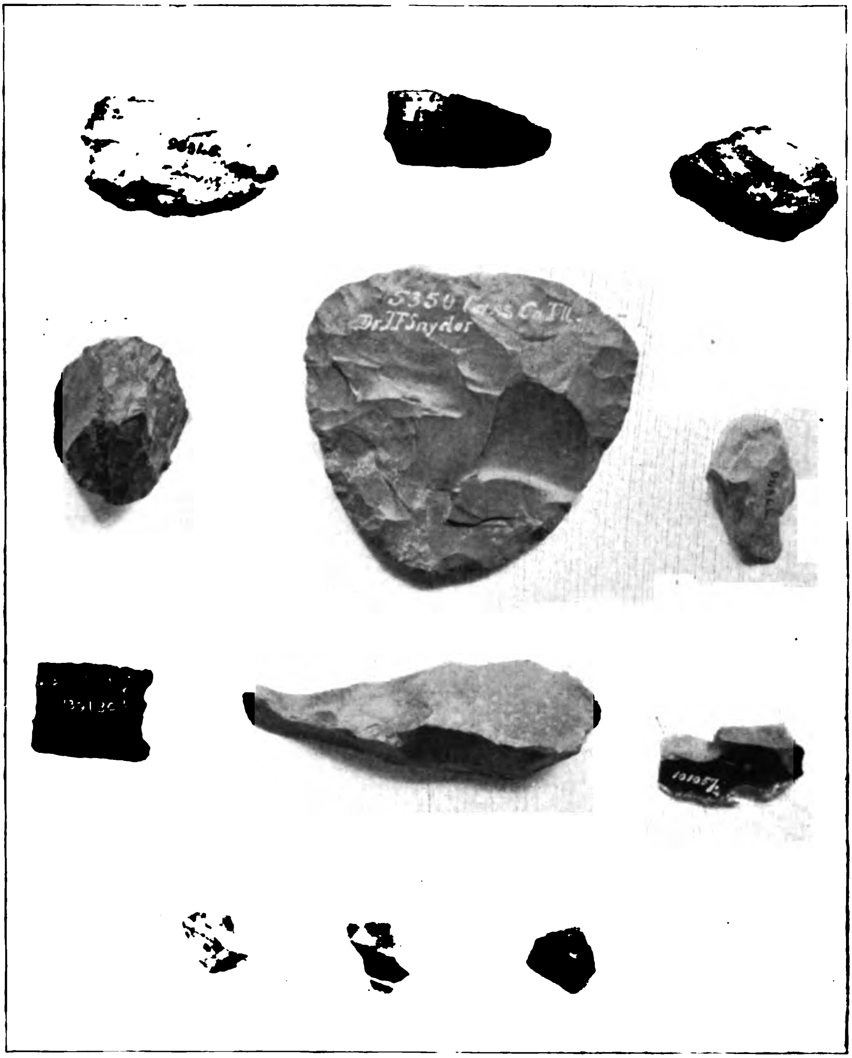
Fig. 8. FRAGMENT OF SMALL FLINT IMPLEMENT.
(Cat. No. 101058, U.S.N.M. Kitchen-Midden, Havelse, near Copenhagen, Denmark. Thomas Wilson.)

Figs. 9, 10. WORKED FLINT FLAKES.
(Cat. No. 100138, U.S.N.M. Camp Barbet, Mouy, near Paris (Seine-et-Oise), France, Thomas Wilson.)

Fig. 11. FLINT NUCLEUS.
(Cat. No. 100139, U.S.N.M. Camp Barbet, France. Thomas Wilson.)

Figs. 12, 13, 15. FLINT SCRAPERS.
(Cat. Nos. 100103, 100097, 100110, U.S.N.M. Camp Barbet, France. Thomas Wilson.)

Fig. 14. FLINT HAMMERSTONE.
(Cat. No. 100086, U.S.N.M. Camp Barbet, France. Thomas Wilson.)



SPECIMENS OF ROCK FROM WHICH THIN SECTIONS WERE MADE.

EXPLANATION OF PLATE 24.

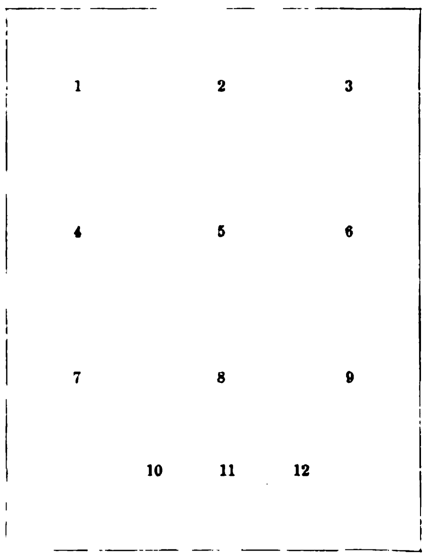


Fig. 1. Rude Flint Implement.

(Cat. No. 98346, U.S.N.M. Prehistoric mine or quarry, Flint Ridge, Licking County, Ohio. Gerard Fowke.)

Fig 2. Leaf-shaped Implement of Quartz-porphyry.

(Cat. No. 139026, U.S.N.M. Muncy Valley, west branch of Susquehanna River, Pennsylvania. J. M. M. Gernerd.)

Fig. 3. Leaf-shaped Implement of Argillite (?).

(Cat. No. 139010, U.S.N.M. District of Columbia, in vicinity of Chain Bridge. Ernest Shoemaker.)

Fig. 4. Flint Core.

(Cat. No. 98344*a*, U.S.N.M. Prehistoric mine or quarry, Flint Ridge, Licking County, Ohio. Gerard Fowke.)

Fig. 5. Chipped Flint Disk.

(Cat. No. 15350, U.S.N.M. Cass County, Illinois. Dr. J. F. Snyder.)

Fig. 6. Flint Core.

(Cat. No. 98344, U.S.N.M. Prehistoric mine or quarry, Flint Ridge, Licking County, Ohio. Gerard Fowke.)

Fig. 7. Modern Gunflint.

(Cat. No. 139130, U.S.N.M. Brandon, England. Edward Lovett.)

Fig. 8. Large Worked Flint Flake.

(Cat. No. 99908, U.S.N.M. Grand Pressigny (Indre-et-Loire), France. Thomas Wilson.)

Fig. 9. Fragment of Flint Flake.

(Cat. No. 101057, U.S.N.M. Havelse, Denmark. Thomas Wilson.)

Figs. 10–12. Fragments of small Flint Implements.

(Cat. No. 101058, U.S.N.M. Kitchen-Midden, Havelse, near Copenhagen, Denmark. Thomas Wilson.)

ical Institute, London, and published, and the objects were figured.[1] The author has taken the liberty of using the figure of the hammer and one of the flint strike-a-lights made with it (figs. 62, 63).

Mr. Evans describes the hammer as—

A small elongated section of square, rudely beaten iron bar, about $2\frac{1}{2}$ inches long by one-third of an inch broad, fitted by means of a hole in the middle to what seemed a very slender handle. Using this instrument with marvelous dexterity, he chipped out the flake into the required shape by short, swift side strokes of the hammer (p. 65).

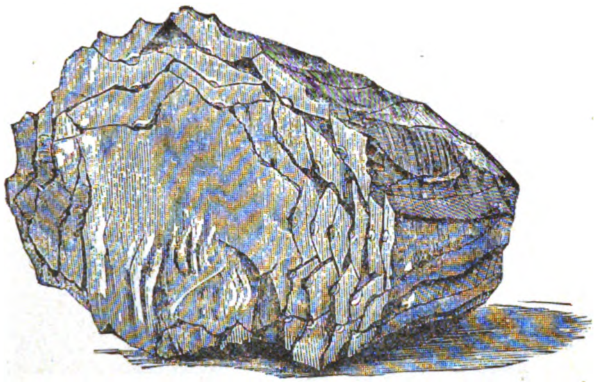


Fig. 64.

FLINT CORE WITH ITS FLAKES IN PLACE AS STRUCK.

Evans Ancient Stone Implements, p. 18, fig. 2.

Reference is made to Plates 8–10, where the modern English flint knapper's hammer is shown in all its varieties.

Nillson[2] gives his personal experience in the art of flint chipping. The methods of treating the nodule or block of flint by the use of the hammer (1) in preparing the nucleus, and (2) in striking off the flakes, have been shown in Plates 8–10 and figs. 62–65, and described in the making of gunflints at Brandon mine and the nuclei at Grand Pressigny (Plate 7, fig. 1). By these descriptions, combined with the figure of a nucleus or core with the flakes once struck off and then replaced, the operation will be understood and the descriptions need not be repeated. Fig. 64 shows one of these nodules from the Brandon quarry which has been chipped into flakes, ready to be cut up into gunflints or arrow points. These flakes, having been struck off, are, in the engraving, replaced so as to show the process. Fig. 65 is a section of a flint nucleus, with several flakes in process of being struck off.

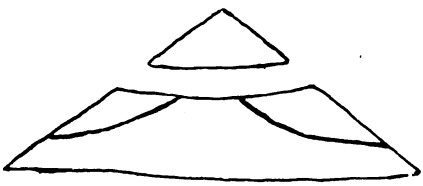


Fig. 65.

SECTION OF FLINT NUCLEUS, SHOWING HOW FLAKES ARE STRUCK OFF.

Plate 25 shows the cores, flakes, and the finished arrowheads of obsidian as they are found in America. This material is of volcanic origin and it is usually attributed to the Rocky Mountain

[1] Proceedings, XVI, p. 65, pl. I.

[2] The Stone Age of Scandinavia, p. 7.

ranges, though by commerce specimens have traveled great distances. Prof. W. K. Moorehead found about a thousand large and well-wrought obsidian spearheads and arrowpoints in the great mound on Hopewell farm,[1] Ross County, Ohio, which he has cited in The Antiquarian.[2]

The specimens shown in Plate 25, figs. 1 to 4, are cores of great size and beauty. The flakes have never been replaced as in the case of the Brandon core just shown, but one can easily see that the mode of manufacture was the same. They were struck off by a blow, and the conchoid of percussion is always to be seen on both the flake and the core. The arrowpoints and spearheads, leaf-shaped and stemmed, are samples of those of obsidian from the Pacific coast. Their chipping shows delicate workmanship.

HAMMERSTONES.

Fig. 66.—White jaspery flint.
Ohio.
Cat. No. 17311, U.S.N.M. ½ natural size.

Fig. 67.—Quartzite pitted.
New York.
Cat. No. 6602, U.S.N.M. ½ natural size.

The principal tool used by prehistoric man was the stone hammer (fig. 66–7). Thousands of these have been found, and their distribution extends over nearly the entire prehistoric world. They were hard, so as to stand the blows without breaking. Any sort of stone which possessed the requisite condition of hardness and was of suitable size would serve the purpose. Bowlders of quartzite were not infrequently used and the periphery or prominent ends or corners frequently show the battered or pecked surface, the evidence of use. Many of these quartzite bowlders have a cup marking on the one or the other of the flattened sides, the precise purposes of which have never been satisfactorily determined. It has been contended by some that they were indentations for the thumb and fingers, to assist in holding the hammer in the hand, but this theory has not been accepted.

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[1] Clark's Work; Squier and Davis, Smithsonian Contributions to Knowledge, No. 1, p. 26, pl. x.

[2] October, 1897, p. 255, fig. xlvii; November, 1897, p. 291, figs. 1, liv, lv.

EXPLANATION OF PLATE 25.

1 2 3 4 5 6

7 8

9 10 11 12 13 14 15

20 21 22

16 17 18 19

23 24 25 26 27 28 29 30 31

Figs. 1–3. OBSIDIAN CORES.
(Cat. Nos. 98772, 98771, 98768, U.S.N.M. Cholula, Mexico. W. W. Blake.)

Fig. 4. OBSIDIAN CORE.
(Cat. No. 1049, U.S.N.M. Mound near Vera Cruz, Mexico. Lieutenant Van Wyck, U. S. N.)

Figs. 5, 6. OBSIDIAN CORES.
(Cat. Nos. 98776, 98769, U.S.N.M. Mexico. W. W. Blake.)

Figs. 7, 8. SMALL FLAKES OF OBSIDIAN.
(Cat. No. 20025, U.S.N.M. Mounds near Cordova, Mexico. Dr. Hugo Finck.)

Fig. 9. LEAF-SHAPED IMPLEMENT OF OBSIDIAN.
(Cat. No. 139397, U.S.N.M. Klamath Indian Reservation, Oregon. C. K. Smith.)

Fig. 10. LEAF-SHAPED IMPLEMENT OF OBSIDIAN (broken).
(Cat. No. 9347, U.S.N.M. Cordova, Mexico. Dr. Hugo Finck.)

Fig. 11. WORKED FLAKE OF OBSIDIAN (scraper?).
(Cat. No. 98765, U.S.N.M. Mexico. W. W. Blake.)

Figs. 12–15. FLAKES OF OBSIDIAN.
(Cat. No. 9359, U.S.N.M. Cordova, Mexico. Dr. Hugo Finck.)

Fig. 16. ARROWPOINT OF OBSIDIAN.
(Cat. No. 98777, U.S.N.M. Mexico. W. W. Blake.)

Fig. 17. ARROWPOINT OF OBSIDIAN.
(Cat. No. 9355, U.S.N.M. Cordova, Mexico. Dr. Hugo Finck.)

Fig. 18. ARROWPOINT OF OBSIDIAN.
(Cat. No. 98792, U.S.N.M. Tezcuco, Mexico. W. W. Blake.)

Figs. 19, 20. ARROWPOINTS OF OBSIDIAN.
(Cat. Nos. 9354, 9353, U.S.N.M. Cordova, Mexico. Dr. Hugo Finck.)

Fig. 21. LEAF-SHAPED IMPLEMENT OF OBSIDIAN.
(Cat. No. 9352, U.S.N.M. Cordova, Mexico. Dr. Hugo Finck.)

Fig. 22. ARROWPOINT OF OBSIDIAN.
(Cat. No. 139398, U.S.N.M. Klamath Indian Reservation, Oregon. C. K. Smith.)

Figs. 23, 24. ARROWPOINTS OF OBSIDIAN.
(Cat. Nos. 98781. 98786, U.S.N.M. Mexico. W. W. Blake.)

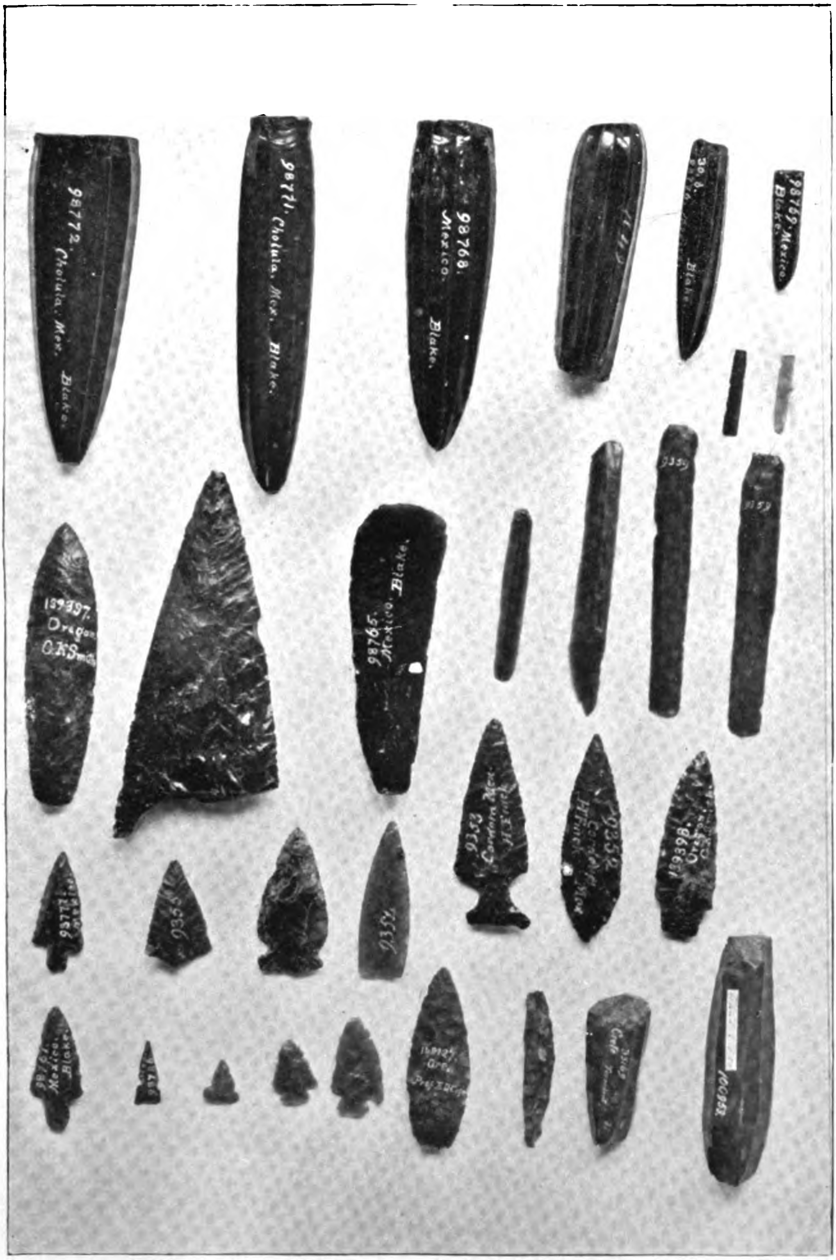
Figs. 25–27. OBSIDIAN ARROWPOINTS.
(Cat. No. 149391, U.S.N.M. Buttes, 4 miles west of Upper Gallinas, New Mexico. Lieut. G. M. Wheeler.)

Fig. 28. LEAF-SHAPED IMPLEMENT OF OBSIDIAN.
(Cat. No. 148127, U.S.N.M. "Equus beds" near Silver Lake, Oregon. Prof. E. D. Cope.)

Fig. 29. WORKED FLAKE OF OBSIDIAN.
(Cat. No. 35176, U.S.N.M. Island of Crete. G. L. Feuardent.)

Fig. 30. OBSIDIAN CORE.
(Cat. No. 35169, U.S.N.M. Island of Crete. G. L. Feuardent.)

Fig. 31. FLINT CORE.
(Cat. No. 100953, U.S.N.M. Lund, Sweden. Thomas Wilson.)



OBSIDIAN CORES, FLAKES, AND FINISHED ARROWPOINTS.

Principally from North America.

The principal kind of hammer used, especially in Europe and at Flint Ridge in Ohio, and in all other places where there is a stratum of flint, is a rude and irregular piece of flint from the ledge. Its sharp corners and edges served better the purpose of a hammer, enabling the workmen to strike a more precise blow and with a smaller point of impact.

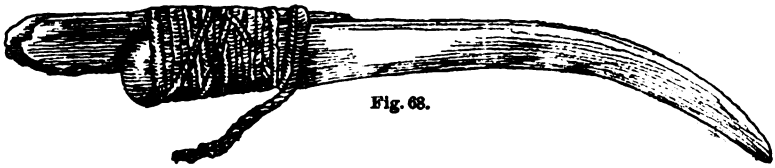


Fig. 68.

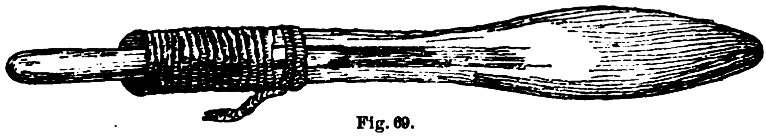


Fig. 69.

ESKIMO ARROW FLAKERS, POINT OF REINDEER HORN, HANDLE OF IVORY.

Evans, Ancient Stone Implements, p. 34, fig. 8.

As one corner or edge became worn, the hammer was turned in the hand to present another, until at last the corners were all worn off and the tool became practically a globe, when it is believed to have been unfit for further use and was discarded.

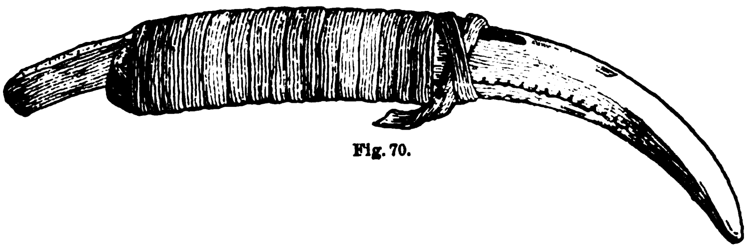


Fig. 70.

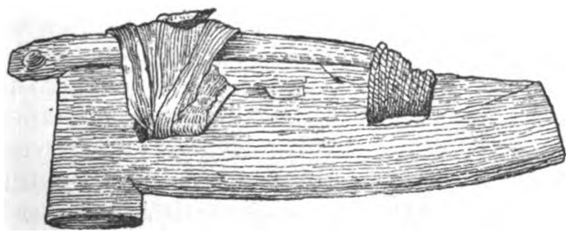


Fig. 71.

ESKIMO ARROW FLAKERS, POINTS OF REINDEER HORN, HANDLES OF WOOD AND IVORY.

Plate 5, fig. 11, represents a hammerstone from Spiennes, Belgium, and Plate 7, fig. 11, one from Grand Pressigny, France. In working

flint in modern times steel hammers are employed. (See Plates 8–10, figs. 62, 63.)

Mr. J. D. McGuire has published the result of some experiments on the hammerstone.[1]

In the inventory of tools the flaker must not be overlooked. Many of these have been found. The Eskimos use those of ivory fastened to a handle (figs. 68–71). These were used for chipping by pressure. The real prehistoric flakers have been found. They were simply pieces of bone or horn, usually the point of a deer horn, with sufficient length to insure a firm grip. The workman, having chipped his piece to proper form by percussion, desiring to bring it to an edge, took it in one hand, the flaker in the other, and by placing its point against the portion to be removed, with a pressure in the right direction and an artistic or

Fig. 72.

Fig. 73.

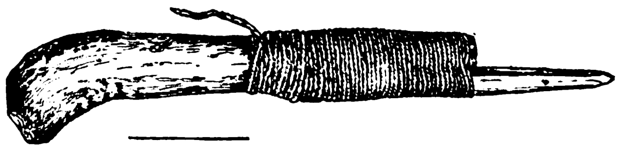


Fig. 74.

FLAKERS OF ANTLER OR BONE IN HANDLES OF WOOD.

Fig. 72.—Nevada Indians.

Smithsonian Contributions, XXII; Rau, Archæology, p. 95, fig. 340.

Figs. 73, 74.—Hupa Indians.

Smithsonian Report, 1886, Ray Collection, pl. XXI, figs. 92, 96.

mechanical twist of the wrist, he started a small flake of greater or less breadth, thickness, and length.

Figs. 72–74 are arrow flakers, the former used by the Indians of Nevada,[2] while the latter are from the Point Barrow Eskimos, Alaska, collected by Col. P. H. Ray, and described by Dr. O. T. Mason.[3]

The art of the prehistoric flint chipper requires a high order of mechanical dexterity. Some of the specimens show marvelously fine work—flakes so thin, wide, long, and regular as to extort our wonder and admiration. (Figs. 92, 151, from a mound near Naples, Illinois.)

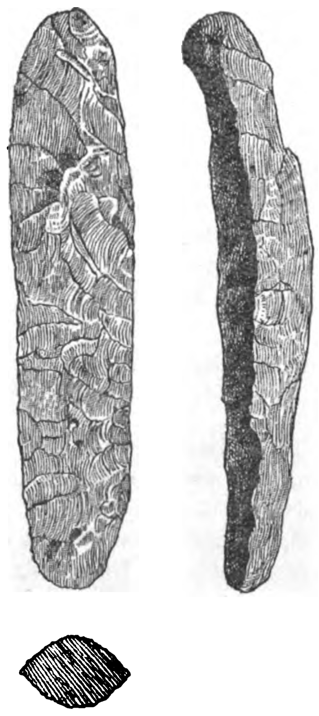
The flaking tools of Europe have never been satisfactorily determined. In the present condition the number of finely flaked objects is enormously out of proportion with the number of flakers found. Of those

[1] American Anthropologist, IV, pp. 301–12, 1891.

[2] Charles Rau, Archæol. Coll. U. S. Nat. Mus., p. 95, fig. 340.

[3] Ray Collection, Smithsonian Report, 1886, pl. XXI, figs. 92, 96.

implements found which might have served for this purpose, the number recognized and admitted as such is comparatively few. Some are of bone, some of horn, and others (strange to America) are of flint. Dr. Capitan, in the display of the Ecole d'Anthropologie at the Paris Exposition in 1889, showed a bone flaker, and he described and figured it in the report of that display made to the minister of public instruction. In the author's European collection are several implements of horn which probably served the same purpose. They are doubtless to be found in every collection. They are short, round, with a blunt point like one's little finger. This tool is usually of deer horn in its natural condition, long enough to have been held in the hand, but is sometimes cut short, with a possible tang as for insertion in a handle. Bone points are in every collection and are well known to every prehistoric archæologist; but they are sharply pointed as if for awls or perforators of skin or textile fabrics. The foregoing is a different implement and could never have served as an awl. One could no more punch a hole through a piece of skin with one of these than he could with the point of his finger, which it so much resembles. The author is of the opinion that they may have served as flakers. Tools similar in form are found of flint. Sir John Evans calls them fabricators or flaking tools[1] (figs. 75, 76). In France they have been called ecrasoirs, but M. de Mortillet prefers the name retouchoir, and says[2] that their extremities are smoothed by use. They served to flake by pressure (retouch) the flint implements. This operation had the effect of smoothing the ends of the involved implement. In Le Musée Préhistorique (Plate XLV, figs. 411–418) are several of these implements, chiefly from the interior of France. Sir John Evans[3] discusses these implements, but confesses his suggestions are by no means conclusive, and closes with the hope that future discoveries may throw more light on the subject. He figures and describes several from England, and says they are well known, and in Yorkshire are called



Figs. 75, 76.
FLINT FLAKERS (?) WITH SMOOTH ROUNDED ENDS, WORN BY USE.
Yorkshire, England.
Evans, Ancient Stone Implements, p. 367, fig. 346.

[1] Ancient Stone Implements, p. 367.
[2] L'Homme Prehistorique, p. 517.
[3] Ancient Stone Implements, pp. 367–371.

"finger flints." His fig. 346 (p. 367) is from Yorkshire, and is here reproduced as figs. 75, 76. His description of it is that it is solid, symmetrically chipped, of gray flint, and is curved at one extremity, with a view of adapting it for being better held in the hand. The edges, originally chipped sharp, have been slightly rounded by grinding, apparently with the same motive. The angles at the curved end have been smoothed, but the other end is completely rounded and presents the worn, half-polished appearance characteristic of these tools. They vary much in the amount of workmanship they display, some being mere flakes with the edges rounded by chipping, and others as carefully wrought into form as any hatchet or chisel. They vary in length from 2 to 4 inches. The rougher kinds are usually clumsy in their proportions, as if strength was an object, and they not infrequently show a certain amount of abrasion at each end.

Many early explorers have witnessed the operation of arrowpoint making among the North American Indians and have described it in greater or less detail. These reports have been collected for the convenience of the student and teacher and are published as Appendix D (p. 985).

VII. SCRAPERS, GRINDERS, AND STRAIGHTENERS USED IN MAKING ARROW AND SPEAR SHAFTS.

These implements play a part in the science of prehistoric archæology of an importance quite out of proportion with their appearance.

Spear and lance shafts, to be effective as weapons, must be straight and smooth. If rough or crooked, their effectiveness is much reduced. True, the most primitive spear made of a sapling, the point hardened by fire and left rough with knots and branches, might be a dangerous weapon in a hand to hand contest; but it would be more easily handled and more effective if made straight and smooth. For a javelin or arrow intended to be cast or thrown, either by the hand or with a bow, it is imperative that the shaft should be straight and smooth.

Many of the arrow shafts of antiquity were of reed or cane, perhaps because reed and cane were more plenteous and more easily adapted. They were the right size, could be made the right length, were light, straight, smooth, and required but slight preparation for use. Still, these would require some straightening and smoothing, and to that end tools were required.

In Europe the arrow-shaft scraper was used more than the arrow-shaft polisher or grinder; in America it seems to have been the reverse. In Europe, while polishers were used for many purposes, they seem not to have been much used on arrow shafts.

The arrow-shaft scraper (Plate 26) is a tool for that special purpose. It is of flint chipped to a concave edge. The specimen from England

EXPLANATION OF PLATE 26.

1 2 3

4 5

6 7

8 9

Fig. 1. From Yorkshire Wolds, England.
(Evans, Ancient stone implements, etc., p. 287, fig. 226.)

Fig. 2. From Chicago, Illinois.
(Carl Dilg.)

Fig. 3. From Indiana.
(Cat. No. 32367, U.S.N.M. Rev. F. M. Symmes and James Jones.)

Fig. 4. From Tennessee.
(Cat. No. 58720, U.S.N.M. James M. Null.)

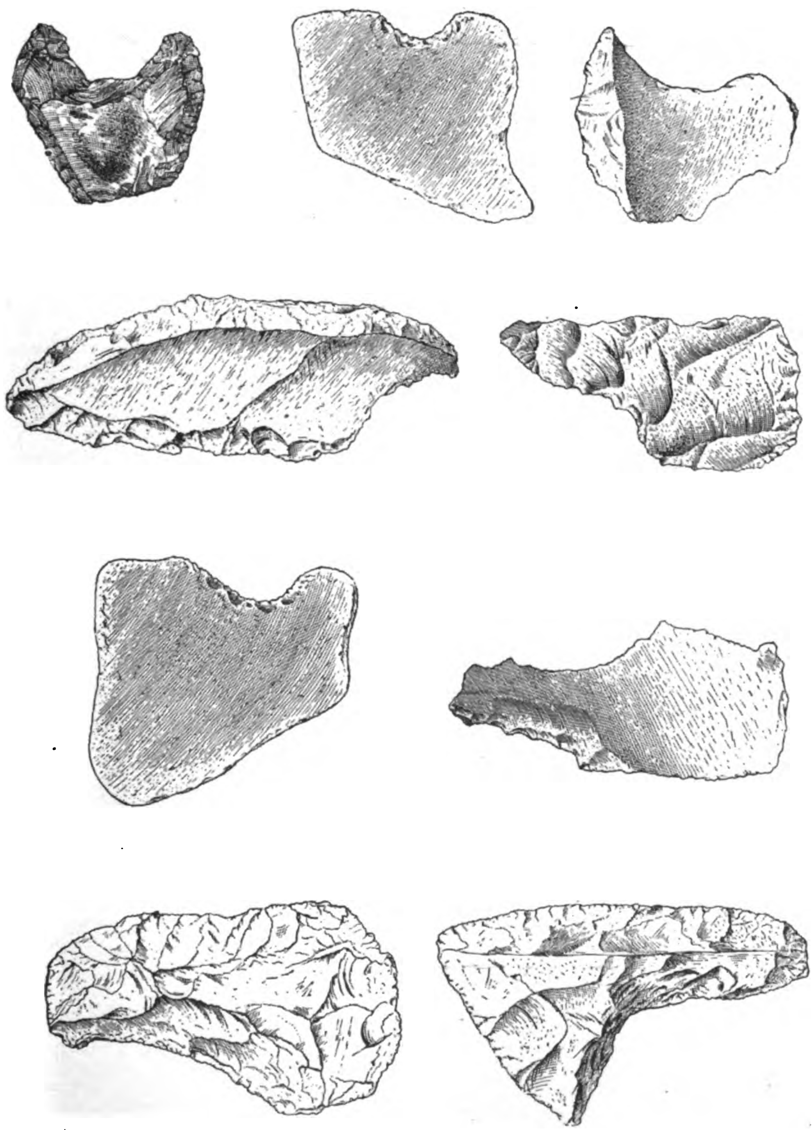
Fig. 5. From Indiana.
(Cat. No. 140746, U.S.N.M. H. Rust.)

Fig. 6. From Chicago, Illinois.
(Carl Dilg.)

Fig. 7. From Clarksville, Hamilton County, Indiana.
(Cat. No. 140743, U.S.N.M. H. Rust.)

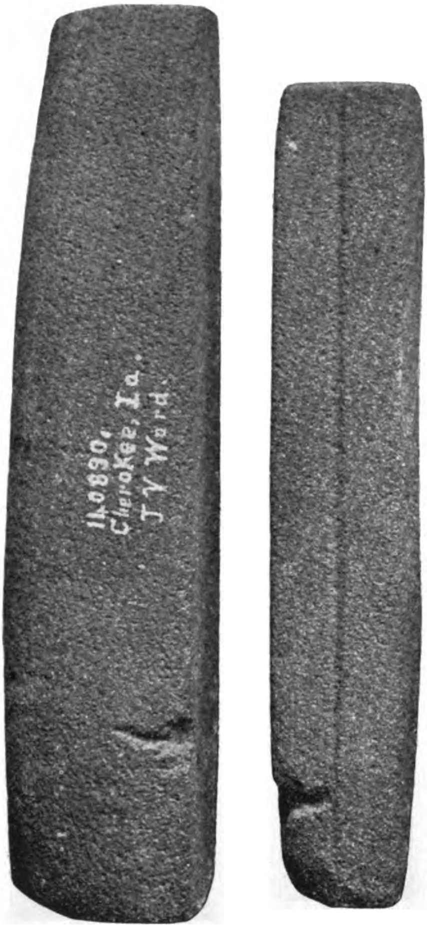
Fig. 8. From California.
(Cat. No. 30508, U.S.N.M. S. Bowers.)

Fig. 9. From Ohio.
(Cat. No. 139958, U.S.N.M. Thomas Wilson.)



CONCAVE ARROWSHAFT SCRAPERS OF FLINT.

England and United States.



ARROWSHAFT GRINDERS.

Loose gritty sandstone.

Cherokee, Iowa.

Cat. No. 140890, U.S.N.M.

(fig. 1) comes from Yorkshire Wolds, and is taken from Sir John Evans's Ancient Stone Implements,[1] where it says:

Tools of this kind are well adapted for scraping into regular shape the stems of arrows or the shafts of spears, or for fashioning bone pins.

The round-ended scraper, supposed to have served for scraping skins, had a common form in Europe (Plate 12) and America. They may have been used for scraping arrow shafts in either or both countries, but of this we have no evidence save their plenteousness and the possibility of such use. Eskimos continued the use of the round-ended scraper, inserted in either wooden or ivory handles, until modern if not until present times. They have been figured and described by Sir John Lubbock,[2] Sir John Evans,[3] and Dr. O. T. Mason.[4]

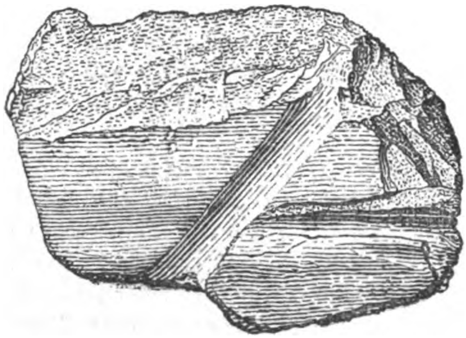


Fig. 77.

ARROW-SHAFT GRINDER, CHLORITE SLATE.

Cape Cod, Massachusetts.

Cat. No. 17868. U.S.N.M. ½ natural size.

But the scrapers with a concave edge, for scraping arrows, are rarely found in prehistoric collections, nor are they reported among the Indians of North America. The U. S. National Museum possesses some, but not many. They seem not to have been recognized or cared for and were not gathered by collectors. Figs. 1–8 in Plate 26 are seven specimens inserted as examples of thirty or forty from the Ohio and Mississippi valleys.[5]

Dr. Charles Rau, in an unpublished manuscript, divided some arrow-making implements into arrow-shaft grinders and straighteners, though he admits that both might have been used for smoothing the shafts.

Fig. 77 represents an arrow-shaft grinder, with a straight groove of suitable size, of compact chlorite slate from Cape Cod, Massachusetts (Cat. No. 17868, U.S.N.M.). As the stone is not at all gritty, the process must have been performed with the assistance of sand and water.

Plate 27 contains specimens of what are supposed to have been arrow-shaft grinders. They are coarse sandstone, exceedingly gritty, and would serve the purpose well. The top is rounding or oval, the sides parallel, while the bottom is flat, with a groove in it, as shown in the specimen. The size is indicated by the scale. They are from Cherokee, Iowa. Similar ones have been found in other localities.

Somewhat allied to the arrow-shaft grinders are the arrow-shaft straighteners—more or less carefully prepared stones, generally of

[1] Page 287, fig. 226.

[2] Prehistoric Times, 4th ed., p. 513, figs. 214–216.

[3] Ancient Stone Implements, p. 268, fig. 203.

[4] Report U. S. National Museum, 1889, pp. 553–589, pls. LXI–XCIII.

[5] Robert Munro, Prehistoric Problems, 1897, p. 329, figs. 117, 118.

oblong form and exhibiting on the upper face a groove, or sometimes two or three parallel grooves, for receiving the arrow shafts (fig. 78). The grooves are mostly smooth and shining from long usage. Mr. Paul Schumacher found a number of these implements in southern California graves, and he describes their application.[1] The stones were heated and the crooked shafts rubbed back and forth in the grooves under pressure until they became straight. As the stones had to withstand a considerable degree of heat, serpentine, a material possessing that quality, was generally chosen. Straighteners of the ruder kind were made in California of fragments of soapstone vessels. The Apaches and other western tribes used until lately very neat straighteners of serpentine, often provided with two grooves. The author, however, was informed that they did not heat the stone, but heated the shafts, and then pressed them back and forth in the grooves. Some of the California specimens have been crackled by the heat to which they were exposed. From the uniform polish of the grooves, it may be inferred that such stones were also used for smoothing the shafts. Similar utensils, apparently for the same use, are in the Museum collection, ranging in locality from Massachusetts to California.

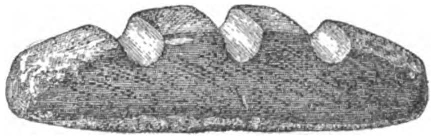


Fig. 78.

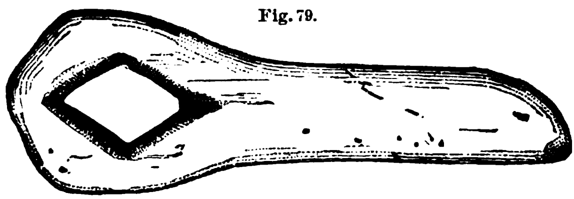
SERPENTINE ARROW-SHAFT STRAIGHTENER WITH THREE SMOOTH GROOVES, ORNAMENTAL IRREGULAR INCISED LINES.

Santa Barbara County, California.

Cat. No. 20215, U.S.N.M. ½ natural size.

The Eskimos used a different tool for straightening their arrow shafts. It was a piece of bone, or frequently ivory, heavy and solid, with an enlargement at the upper end through which was a perforation usually of lozenge shape. The arrow shaft was put through this hole, and the instrument, used as a wrench, bent the shaft as was required to make it straight. Dr. Boas figures one of them[2] (fig. 79), and European prehistoric archæologists have frequently done the same.[3]

Fig. 79.



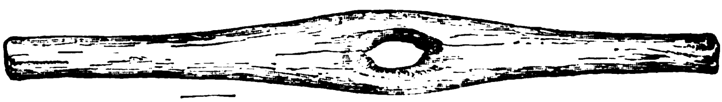


Fig. 80.

ARROW-SHAFT STRAIGHTENERS OF WOOD OR IVORY.

Fig. 79, Central Eskimo.

6th Ann. Rept. Bur. Ethnol., 1884-5, fig. 474, p. 525.

Fig. 80, Hupa Indians. Smithsonian Report, 1893, pl. xxxix, fig. 1.

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[1] Archiv. für Anthropologie, IX, p. 249.

[2] Central Eskimo, Sixth Ann. Rept. Bur. Ethnol., 1884–85, p. 525, fig. 474.

[3] Boyd Dawkins, Early Man in Britain, p. 238, fig. 92.

Dr. Hoffman, in his article entitled "The Graphic Art of the Eskimo,"[1] figures a half dozen of these similar in some regards to those already shown. They are from Cape Nome, Sledge Island, Diomede, and Cape Darby, all on the Alaskan coast. He introduces these in the attempt to correlate them and similar specimens of Eskimoan art with that of the Paleolithic period as manifested in the specimens from the caverns of Dordogne, France, a proposition to which the author does not agree.

Fig. 80 is an arrow-shaft straightener used by the Hupa Indians of California. It is a piece of yew, 10 inches long, spindle-shaped, and having an oblong hole through the middle. The arrow shaft is drawn through the hole and straightened by pressure on the ends of the tool.[2]

VIII. CLASSIFICATION OF ARROWPOINTS AND SPEARHEADS.

I, leaf-shaped; II, triangular; III, stemmed; IV, peculiar forms.

Dr. Rau had prepared a paper entitled "The Typical Forms of North American Prehistoric Relics of Stone and Copper in the United States National Museum," but he died before it was completed. It has always been the author's intention to complete and publish this paper. That portion of the text relating to arrowpoints and spearheads is as follows:

ARROW AND SPEARHEAD SHAPED OBJECTS.

They constitute the most numerous class of chipped-stone articles in the United States. Collectors are very apt to designate indiscriminately all objects of dart-head-like form, as arrow or spear points, without considering that many of these specimens may have been quite differently employed by the aborigines. Thus several Western tribes used, within recent times, chipped-flint blades identical in shape with those that are usually called arrow and spear heads, as knives, fastening them in short wooden handles by means of a black resinous substance or asphaltum.

The stone-tipped arrows quite recently made by various Indian tribes are mostly provided with slender points, often less than an inch in length, and seldom exceeding an inch and three-quarters, as exemplified by many specimens of modern arrows in the National Museum. If this fact be deemed conclusive, it would follow that the real Indian arrowhead was comparatively small, and that the larger specimens classed as arrowpoints, and not a few of the so-called spearheads, were originally set in handles and were used as knives and daggers. However, it is not improbable that in former times larger arrowheads were in use among the natives.

In many cases, further, it is impossible to determine the real character of leaf-shaped or triangular objects of chipped stone, as they may have served as arrowheads, or either as scrapers or cutting tools in which the convex or straight base formed the working edge. Certain chipped spearhead shaped specimens with a sharp straight or convex base may have been cutting implements or chisels. Arrowheads of a slender form pass over almost imperceptibly into perforators, insomuch that it is often impossible to make a distinction between them.

In view of these uncertainties, the writer has brought the arrow and spear point shaped objects under one head, which is the more excusable as, generally speaking, size is the only distinguishing feature.

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[1] Report U. S. National Museum, 1895, p. 765, pls. 7, 8.

[2] Otis T. Mason, North American Bows, Arrows, and Quivers, Smithsonian Report, 1893, pl. XXXIX, fig. 1.

The attempt is here made to segregate and classify arrowpoints, spearheads, and knives. In Europe they have always been denominated arrowpoints or spearheads, determinable only by their size; in the United States, by comparison with those of the Indian of historic time, we have been able to draw the line of demarcation possibly with greater accuracy. We have also discovered, through the prehistoric as well as the historic Indians, that these implements may have been used as knives; therefore, in the headings, they have been denominated by all three names—arrowpoints, spearheads, and knives.

No racial or tribal classification is here attempted from these implements. If classified according to material, and afterwards divided geographically, they ought to tell of the difference in the various peoples using them, if any such existed. This work the author has yet before him.

We have already seen that the material employed would be that which would serve the purpose best and was nearest and most easily obtained. The elements of commerce and ease of transportation must be regarded in ascertaining the locality of the material. To correctly determine this, we must consider the known facts as to distance, quality, weight, and value of material transported.

The present classification is based on the form and size of the implement. In order that the series contemplated by the present classification shall be as complete as possible, those from Europe which belong to the earlier epochs are included. The weapons of the Paleolithic period—the Chelléen implements, the Mousterien spear points, the Solutréen leaf-shaped and one-shouldered points, and the Madelainien points and harpoons—have been already described, and we have concluded that they may have served as spears, lances, javelins, or harpoons, but not arrowpoints or knives. The leaf-shaped implements used as spear and harpoon heads in the Paleolithic period continued into the succeeding prehistoric periods, and were then used as arrowpoints as well as for spears or harpoons. This does not clash with the theory that arrows were not used during the Paleolithic period.

A classification of arrowpoints and spearheads has been attempted by but few archæologists. Sir John Evans,[1] General Pitt-Rivers,[2] Sir W. R. Wilde,[3] and Dr. Charles Rau are the principal ones who have essayed a classification, but in their descriptions they scarcely employed their own. The first two gentlemen made four classes. Some of the classifications were arranged according to probable successive development, thus: leaf-shaped, lozenge-shaped, tanged or stemmed, and triangular. Sir W. R. Wilde (and Sir John Lubbock follows him) arranged them thus: triangular, indented base, stemmed, barbed, and leaf-shaped. Dr. Edwin A. Barber[4] as follows: leaf-shaped, triangular,

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[1] Ancient Stone Implements of Great Britain, pp. 328–364.
[2] Primitive Warfare, Jour. R. U. Service Inst.
[3] Catalogue of Antiquities, Royal Irish Acad., pp. 19, 21, 23.
[4] American Naturalist, XI, p. 265.

indented at the base, stemmed, barbed, beveled, diamond-shaped, awl-shaped, and those having the shape of a serpent's head. Dr. Abbott[1] does not make any formal classification, but uses as descriptive terms: barbed, triangular, leaf-shaped, lozenge-shaped, notched base, serrated, stemmed, barbed triangular, triple-notched-based, unsymmetrical. Dr. Rau originally made a classification of 22 subdivisions, but in the paper prepared just before his death, he made another, as follows:

Convex or straight-sided (rarely concave-sided) with convex, straight, or concave base.

Notched at the sides near the base, which is convex, straight, or concave, rarely pointed.

Stemmed; expanding stem with convex, straight, or concave base.

Stemmed; parallel-sided stem with convex, straight, or concave base.

Stemmed; contracting straight-sided stem with convex, straight, or concave base.

Stemmed; contracting broad stem with rounded or pointed termination.

Stemmed; tapering stem.

Barbed and stemmed.

Leaf-shaped implements; rounded at one end, pointed at the other; pointed at both ends; rounded at both ends.

The making in my department during the year 1891–92, of the 100 series of 100 casts each of typical implements of the United States, for educational purposes, afforded the opportunity, if it did not create the necessity, for a comprehensive classification. To send out a series of arrowpoints or spearheads without classification or name would be a waste of time and labor; while, if made of plaster, they would be so fragile as to be a waste of money as well. Therefore I prepared series of these implements, classified them by type, arranged them by size, and had them photographed and engraved, each class by itself so they might be understood almost as well as from an inspection of the originals. It was found necessary to employ many specimens to make a proper display. Many of these objects in the same division are similar in form, appearance, and material, the main difference being in their size. But this difference of size may change the character, use, and name of the weapon, and it may, according to size, become an agricultural implement used for digging in the earth: a spear, dagger, poniard, scalping or fish knife, or an arrowpoint or lancet. All these sizes of implements with uses and names are known to students of prehistoric archæology and collectors of antiquities. This difference in size is a reason for giving many cuts of the same form of implements but of different sizes. A large implement, if reduced in size, represents to the eye of the beholder a small one. He has seen both the large and the small one, is acquainted with both, and when he sees a cut of given size which is a correct representation of a small implement, he will involuntarily associate it with the real implement of small size. The author has seen an engraving of one of these large digging implements, the original of which was 16½ inches long and 5 inches

[1] Primitive Industry.

wide. The drawing was reduced to one-third, and the engraving one-half from the drawing. Thus this large and formidable implement was represented by a figure 2¾ inches by five-sixths of an inch, which is but the size of a common arrow or spear head. No rule or scale can give it its true appearance in the eyes of the majority of readers. These engravings are intended to serve as a classification of these implements by which their names, and possibly their functions, may be known, and by which archæologists throughout the country, and perhaps the world, may be better enabled to understand and describe them. When we consider that it is beyond the power of mere words to describe a form, and that a figure, cut, or representation of it must be or must have been made at some time in order to communicate knowledge of a form to any person who has not previously seen it, the author trusts he will be justified in the classification and the engravings by which it is sought to be represented.

The names of the different parts of stone arrowpoints and spear-heads or knives are: blade, point, stem, base, edge, shoulder, barb, notch.

The failure of many archæologists (and it is not confined entirely to them) to make a distinction between the words "side" and "edge" has led to a confusion in description. "Border," "rim," "margin" are, or may be, synonymous with "edge," but "side," although much used in this sense, is almost always erroneously used. We say the "side" of a table when we mean the edge, the border, the margin, that part farthest from the center or middle. Applying it to a plank or sword or arrowpoint or spearhead, we should say "edge." "Edge" is particularly appropriate for swords and arrowpoints and spearheads, as it applies specially to the "sharp and thin cutting border or extremity of an instrument."

The author has sought to make his classification as simple as possible. Minute or complex divisions will never be adopted in popular usage. They will be difficult to understand and are impracticable in that they can not be easily remembered or readily applied.

In the author's classification the primary divisions of arrowpoints, spearheads, or knives are as follows:

Division I, leaf-shaped.—In this classification the leaf-shaped is placed at the head as being the oldest implement of its kind. This division includes all kinds: elliptical, oval, oblong, or lanceolate forms bearing any relation to the shape of a leaf, and without stem, shoulder, or barb.

Class A is pointed at both ends, the widest place one-third or one-fourth from the base.

Class B is more oval, less pointed, with base concave, straight, or convex.

Class C is long and narrow, sharp points, parallel edges, and bases concave, straight, or convex. These belong to the Pacific coast.

Division II, triangular.—This division includes all specimens which, according to geometrical nomenclature, are in the form of a triangle, whether the bases or edges be convex, straight, or concave. They are without stems and consequently without shoulders, though in some specimens the extreme concavity of the base produces barbs when the arrow shaft is attached.

Division III, stemmed.—This division includes all varieties of stems, whether straight, pointed, or expanding, round or flat, except those with certain peculiarities and included in Division IV; and whether the bases or edges are convex, straight, or concave.

Class A is lozenge-shaped, not shouldered nor barbed.

Class B is shouldered, but not barbed.

Class C is shouldered and barbed.

These cover the commoner forms of arrowpoints and spearheads throughout the world. But there are certain other forms which may be few in number or restricted in locality and scarcely entitled to divisions by themselves, yet are found in sufficient numbers and have such definite characteristics that they can not be ignored. These the author has assigned to a general class under the head of "peculiar forms."

Division IV, peculiar forms.—This division includes all forms not belonging to the other divisions, and provides for those having peculiarities, or the specimens of which are restricted in number and locality.

Class A, beveled edges.

Class B, serrated edges.

Class C, bifurcated stems.

Class D, long barbs, square at ends. Peculiar to England, Ireland, and Georgia, United States.

Class E, triangular in section. Peculiar to the province of Chiriqui, Panama.

Class F, broadest at cutting end, tranchant transversal. Peculiar to western Europe.

Class G, polished slate. Peculiar in North America to the Eskimo country and to New England and New York.

Class H, asymmetric.

Class I, curious forms.

Class K, perforators.

DIVISION I—LEAF-SHAPED.

The author essayed botanical and geometrical terms in this description, but found them unsatisfactory. The implements have such variety of form, each slightly different from the other, that specific terms were scarcely ever applicable. They are lanceolate, as already mentioned; leaf-shaped, but as leaves have many different forms, so have these implements, and "leaf-shaped" is rather generic than specific. He essayed the geometrical terms of ovate, oblong, truncated, elliptical, lenticular, but found he could only use them in descriptions of individual specimens.

Dr. Rau, in his unpublished paper, speaking of leaf-shaped implements, said:

These are numerous and of great variety in form and size, insomuch that a minute classification would be difficult. However, they can be divided in a general way into three classes, in accordance with their being rounded at one end and pointed at the other, or pointed at both ends, or rounded at both ends. They vary in length from less than an inch to more than 13 inches, and there is in the National Museum a cast of a sword-like flint blade measuring more than 21 inches in length, which by its form pertains to the class here treated. The original, from a mound in Tennessee, is in the possession of Dr. Joseph Jones, of New Orleans.

Fig. 81 represents a dagger from Madison County, Kentucky. It is dark-brown, much weathered, and difficult to determine its material, probably flinty chert or hornstone. While not the classic leaf-shaped implement which might have been inserted in a shaft and served as a spear, but partaking more of the character of a sword or long dagger to be held in the hand with a wrapping of skin, as shown in specimen from Hupa Valley, California (fig. 78, Plate 41, Cat. No. 126530, U.S.N.M.), yet it is a type of many specimens in North America. A similar specimen in the U. S. National Museum is Cat. No. 88122, from Arkansas, collected by Mr. Edward Palmer, of chalcedonic flint, 12 inches long, 2 inches wide, and three-eighths of an inch thick. It is sharply pointed at both ends and its fine chipping has served to make its edges slightly serrated.

Fig. 81.

LEAF-SHAPED SPEARHEAD OF FLINTY CHERT, POINTED AT BOTH ENDS.

Madison County, Kentucky.

Division I. Class A. 13 x 2¼ x ⅜.

Cat. No. 9407, U.S.N.M.

The specimen, Cat. No. 99823 (U.S.N.M.), the first one on Plate 32, is a piece of beautiful work in flint chipping. The flakes taken off have been long, thin, and fine, and ran from the edge to the center, and have given to it a keen, sharp edge. The specimen is of oolitic chert, 12½ inches long, 3¾ inches wide, and three-fourths of an inch thick.

Other specimens are represented in figs. 82 and 83. They are not, and never were, intended for arrowpoints or spearheads, but rather as swords or possibly ceremonial objects; but as they are leaf-shaped, and from their great length and beauty, with the difficulty of their manufacture, they have been admitted to a place in this paper. Fig. 82 is from an ancient earthwork on the Big Harpeth River, near Franklin, Tennessee. Fig. 83 is from a mound in Oregon.

General Thruston[1] figures and describes many of these long and finely chipped specimens from Tennessee.

[1] Antiquities of Tennessee, pp. 219–252, pls. XI, XIV*a*.

Dr. Rau says of this class:

Some are broad in proportion to their length, others are very slender. The mode of application of these variously shaped implements is doubtful in most cases, but some aid in judging of the use of certain leaf-shaped blades is afforded by the fact that similar ones have been seen shafted or handled in actual employment among modern Indian tribes. It is difficult to draw a line of demarcation between rude and leaf-shaped implements, considering that the former very often approach the leaf form, not only in North America, but also in other quarters of the globe where man had to employ stone in fashioning his tools and weapons.

Fig. 83.
SWORD OF OBSIDIAN.
Oregon.
Division I, leaf-shaped. 15 x 2¼ x ⅝.
Cast, Cat. No. 30190, U.S.N.M.

Fig. 82.
SWORD OF DARK BROWN FLINT.
Williamson County, Tennessee.
Division I, leaf-shaped. 22 x 1⅞ x ⅜.
Cast, Cat. No. 11481, U.S.N.M.

This last remark of Dr. Rau is certainly true as regards the leaf-shaped implement of the Solutréen or Cavern period of the Paleolithic age, but has slight application to those of the Chelléen epoch or Alluvial period. The difference is quite apparent to any person who has any acquaintance with the latter implements. The confusion between the two kinds of implements arises, usually or frequently, among those who depend upon cuts and illustrations for their knowledge rather than on an acquaintance with the real objects. Their error is caused by the illustration usually being of only the flat side without any edge view. The two classes of implements may have a resemblance of outline and of chipped work when looked at from the flat side, but an edge view would reveal the difference at once. The leaf-shaped implement is chipped down thin, frequently to one-fourth of an inch, while the Chelléen implement is more likely to be from 1 to 1¾ inches in thickness. A glance at the folded plate at the end of Sir John Evans's Ancient Stone Implements will show this peculiarity. Reference is made to figs. 1, 2.

Fig. 84 presents the same appearance from a side view as the leaf-shaped. This impression is erroneous. The implement is not one properly called leaf-shaped, and the difference is recognizable by a glance at the specimen. The leaf-shaped implements proper are thin; their thickness is from one-fourth to one-fifth of their width; only one of these here shown is more than one-half inch in thick-

ness. The thickness of the implement represented by this figure is from one-third to one-half of its width. Its thickness makes the difference. The author would not affirm that objects of this class belong to a different epoch or were made by different prehistoric people, nor the difference in the use for which they were intended. The leaf-shaped implements are themselves quite too doubtful on these questions to justify dogmatism on the part of any person, and the latter implements with their differences serve to increase rather than diminish the difficulties of a satisfactory decision. The two figures (85 and 86) present the same idea. From the side view alone one would not know the difference

Fig. 84.

FERRUGINOUS CONGLOMERATE CONTAINING JASPER PEBBLES.

Blount County, Alabama.

Not leaf-shaped (inserted for comparison). $9\frac{7}{8}$ x $2\frac{3}{4}$ x $1\frac{1}{8}$.

Cat. No. 61943, U.S.N.M.

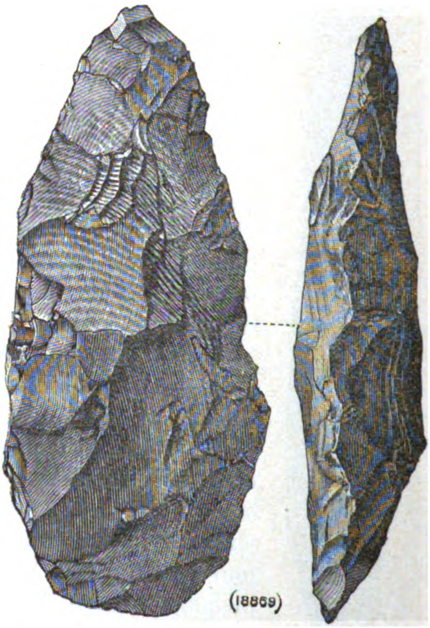


Fig. 85.

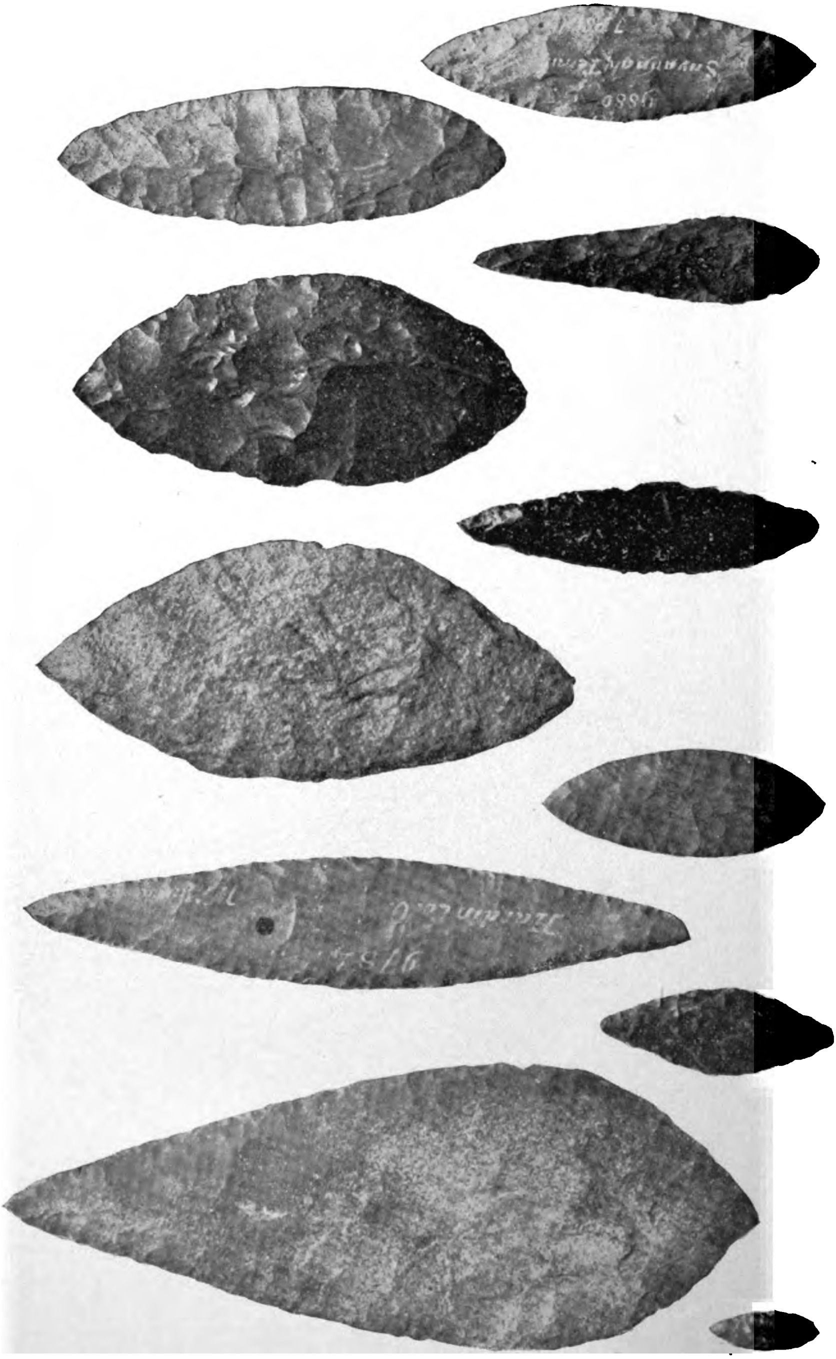
PALE GRAY FLINT HAVING THE APPEARANCE OF AGATIZED WOOD.

Austin, Texas.

Not leaf-shaped (inserted for comparison). $6\frac{1}{4}$ x $2\frac{3}{4}$ x $1\frac{1}{4}$.

Cat. No. 18869, U.S.N.M.

between these implements and those following. But with the thickness remarked one recognizes at a glance that these are not in any sense the leaf-shaped implements we have been considering. They are not made by the same primitive man, nor do they belong to the same epoch of civilization. In Europe the thick one belongs to the earliest epoch



LEAF-SHAPED ARROWPOINTS, SPEARHEADS, OR KNIVES.
Class A.

EXPLANATION OF PLATE 28.

1	2	3	4	5	
11	10	9	8	7	6

LEAF-SHAPED ARROWPOINTS, SPEARHEADS, OR KNIVES.

Class A.

Fig. 1. FINE QUARTZITE.
(Cat. No. 98820, U.S.N.M. Cholulu, Mexico. W. W. Blake.)

Fig. 2. DARK CHALCEDONY.
(Cat. No. 9784, U.S.N.M. Dudley Township, Hardin County, Ohio. W. W. Murch.)

Fig. 3. QUARTZITE.
(Cat. No. 6440, U.S.N.M. Northampton County, Virginia. C. R. Moore.)

Fig. 4. JASPER OR JASPERY FLINT.
(Cat. No. 6633, U.S.N.M. Trinity, Louisiana. G. M. Keim.)

Fig. 5. DARK-GRAY CHALCEDONY OR FLINT.
(Cat. No. 61513, U.S.N.M. Bowling Green, Kentucky. Dr. John R. Younglove.)

Fig. 6. PINKISH FLINT.
(Cat. No. 9880, U.S.N.M. Savannah, Tennessee. J. P. Stelle.)

Fig. 7. LIGHT-BROWN FLINT.
(Cat. No. 5406, U.S.N.M. District of Columbia. J. Varden.)

Fig. 8. BLACK LUSTROUS OBSIDIAN.
(Cat. No. 18088, U.S.N.M. California. J. H. Clark.)

Fig. 9. LIGHT-BROWN QUARTZITE.
(Cat. No. 7063, U.S.N.M. Union County, Kentucky. S. S. Lyon.)

Fig. 10. BLACK FLINTY CHALCEDONY.
(Cat. No. 15280, U.S.N.M. Santa Barbara County, California. Paul Schumacher.)

Fig. 11. PALE-GRAY CHALCEDONY.
(Cat. No. 15754, U.S.N.M. San Miguel Island, California. W. G. Harford.)

of the Paleolithic period, and the thin one, pointed at both ends, to a much later epoch. The first belongs to the Chelléen, Mammoth, Cave-bear, or Alluvium epoch; the second to the Solutréen, Reindeer, or Cavern epoch.

The distinctions between these epochs have not been made in the United States, and possibly do not exist. But the author has ventured to investigate whether the Paleolithic period had not possibly an existence in the United States, and to suggest that these rude and thick implements, acknowledged by all to be so characteristic of the Paleolithic period in Europe, and so unknown to the Neolithic period in both Europe and America, may not have been its representatives.

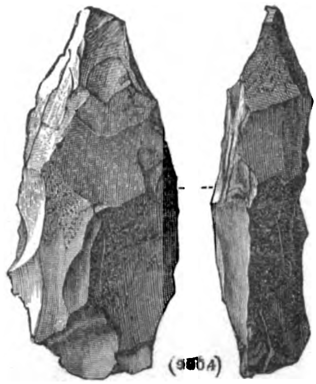


Fig. 86.

YELLOW CHERT.

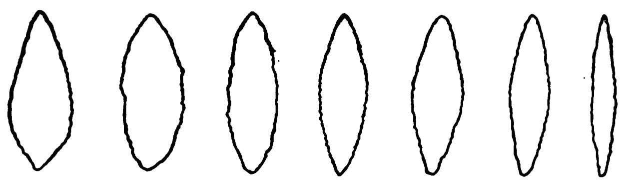
Shell-heap on Tennessee River opposite Savannah, Tennessee.

Not leaf-shaped (inserted for comparison.) $3\frac{7}{8} \times 1\frac{3}{4} \times \frac{7}{8}$.

Cat. No. 9904, U.S.N.M.

Of the thin, true leaf-shaped implements in some of their forms, the author has said they seem to have belonged to both periods, and so their discovery, unsupported by associated objects, is not evidence as to either period. He trusts he has explained the differences between these implements, the thick and the thin—that though from the side view they have great resemblance, yet are really widely separated in culture, time, and art—and he hopes the reader will not confound them.

CLASS A. –POINTED AT BOTH ENDS. (Plate 28.)



This class corresponds to the Solutréen type of the Paleolithic period in France. It is pointed at both ends; it approaches the elliptical and the oval, but is not regular in either form, for its greatest width is about one-fourth to one-third the distance from the base to the point. In France this is called "feuille de laurier" (laurel leaf). It is symmetrical, quite thin, the edges and sides having been chipped with great delicacy and fineness. According to botanical nomenclature it approaches the lanceolate. The appearance of this implement in Europe during the Paleolithic period and its continuance into and through the Neolithic period have been described on p. 828, and need not be repeated. This implement and the convex scraper are common to both periods, and are the two implements which belong equally to the Paleolithic and Neolithic periods.

The following illustrations give a fair idea of these implements in North America. They run the entire range of size, from the very large to the very small. Plate 25 has a fragment of a large one of obsidian from Cordova, Mexico.

Fig. 87.

LEAF-SHAPED IMPLEMENT, POINTED AT BOTH ENDS.

Folsom, Sacramento County, California.

Division I, Class A. 7½ x 3 x ½.

Cat. No. 7349, U.S.N.M.

Fig. 87 is a leaf-shaped implement from Folsom, California, of symmetrical form, though chipped in rough and rather large flakes. It bears the evidence of use. It may have been handled and used as a spear, or it may have had a skin or other wrapping and been used as a knife or dagger.

Fig. 88 is from St. George, Utah. It is of flinty chert, and is a wonderful piece of art in flint chipping. The flakes run to the center, and so have reduced the thickness to the minimum, which is one-eighth of an inch. It is unfortunately broken in three pieces, one of which is lost.

Fig. 88.

LEAF-SHAPED IMPLEMENT, POINTED AT BOTH ENDS.

Division I, Class A. 10¼ x 2¼ x ⅛.

Cat. No. 21014, U.S.N.M.

Fig. 89 is a very thin specimen of fine-grained flinty chert from Union County, Kentucky, and is fig. 9 on Plate 28, Class A.

Fig. 90, from Northampton County, Virginia, is of quartzite and represents a type prevalent along the Atlantic seaboard from the Potomac to the James rivers. It is found in abundance in the neighborhood of Washington City (Plate 28, fig. 3).

Fig. 91 is of chalcedony, delicately chipped, pointed at both ends, and is symmetrically lenticular (Plate 28, fig. 10). Fig. 92 is of obsidian, is similar to fig. 91, but thicker, and its greatest width is nearer the base (Plate 28, fig. 8).

A characteristic of the Mousterien (Paleolithic) point is that it was made from a flake struck from the nucleus with a single blow, and the under or flat side was left unchipped and untouched, while the top or outside was wrought by chipping to a fine edge and point. Fig. 93 is almost unique among American specimens in the U. S. National Museum in the possession of this characteristic. The illustration is of the top side, and it shows the chipping; the other side is a clean fracture with no chipping. The specimen is pale-bluish chalcedony, translucent, and comes from Mexico. It is pointed at both ends and belongs to Class A, leaf-shaped. Fig. 94 is leaf-shaped, elliptical, pointed at both ends, and belongs to Class A. It comes from Georgia. The material is the gray pyromachic chert similar to the large disks (Plates 62–63) found in caches in Ohio and Illinois. The tip-end of the base shows the crust of the pebble from which the implement was made. In general appearance it resembles the others of Class A, but has a distinguishing difference which may assist in determining the method of use of this style of implement. It has two notches opposite each other in the edges near the base, evidently intentional, and which we may assume were for attachment of a handle by ligature. The implement is quite too heavy for an arrowpoint; it might be a spear, but for this; another having the same weight, but shorter and thicker, would serve equally well and not be fragile nor in continual danger of breakage. Whether it was intended

Fig. 89.
LEAF-SHAPED IMPLEMENT, POINTED AT BOTH ENDS.
Division I, Class A.
$2\frac{7}{8} \times 1\frac{1}{8} \times \frac{3}{16}$.
Cat. No. 7063, U.S.N.M.

Fig. 90.
LEAF-SHAPED IMPLEMENT, POINTED AT BOTH ENDS.
Division I, Class A.
$5\frac{3}{4} \times 2\frac{1}{8} \times \frac{1}{8}$.
Cat. No. 6440, U.S.N.M.

Fig. 91.
LEAF-SHAPED IMPLEMENT, POINTED AT BOTH ENDS.
Santa Barbara County, California.
Division I, Class A.
$2\frac{5}{8} \times \frac{7}{8} \times \frac{1}{4}$.
Cat. No. 15280, U.S.N.M.

Fig. 92.
LEAF-SHAPED IMPLEMENT, POINTED AT BOTH ENDS.
California.
Division I, Class A.
$3\frac{3}{4} \times \frac{7}{8} \times \frac{3}{8}$.
Cat. No. 18088, U.S.N.M.

Fig. 93.
LEAF-SHAPED IMPLEMENT, POINTED AT BOTH ENDS.
National Museum, Mexico.
Division I, Class A.
$4\frac{3}{4} \times 2\frac{1}{8} \times \frac{1}{8}$.
Cat. No. 31651, U.S.N.M.

for use as a spear, arrow, knife, or dagger, can be determined positively only by the handle itself, of which, unfortunately, no traces were found.

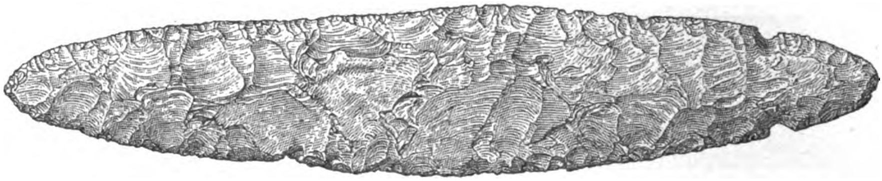


Fig. 94.

LEAF-SHAPED IMPLEMENT, POINTED AT BOTH ENDS, TWO NOTCHES NEAR BASE FOR FASTENING HANDLE.

Gilmer County, Georgia.

Division I, Class A. $9 \times 1\frac{7}{8} \times \frac{3}{8}$.

Cat. No. 98028, U.S.N.M.

It may be useless to speculate on these different uses, but the circumstances seem to point toward its use as a knife or dagger.

The danger of fracture of such long, thin flint implements, so easily broken by the shock which would be inevitable in their employment as spears, appears so much against that employment that the author prefers to believe them to have been knives or daggers. Held in the hand, they would give the maximum of service with the minimum of danger from breakage.

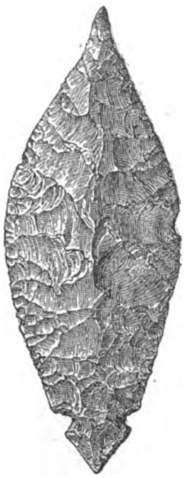


Fig. 95.

LEAF-SHAPED IMPLEMENT OF GRAY HORNSTONE, POINTED AT BOTH ENDS.

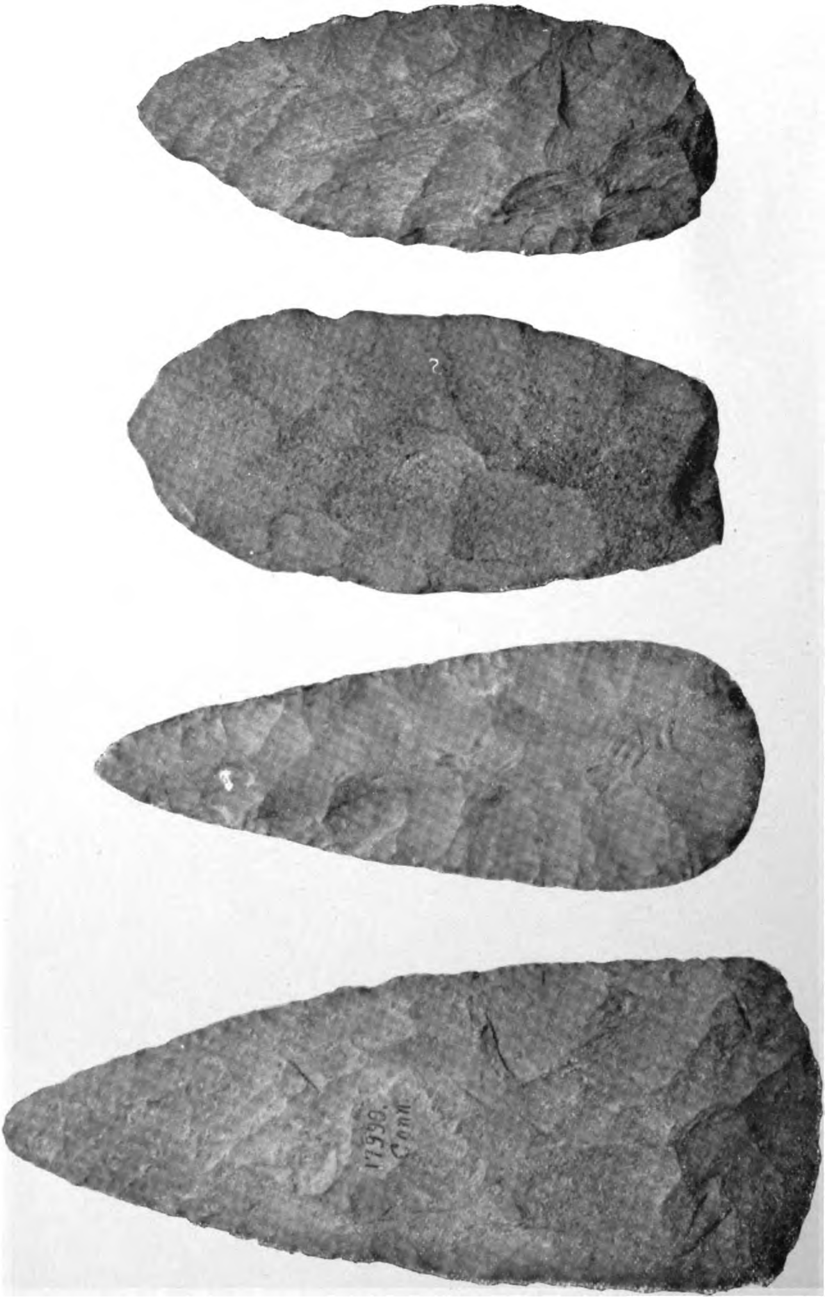
Belleville, St. Clair County, Illinois.

Division I, Class A.

$5 \times 2 \times \frac{5}{16}$.

Cat. No. 32315, U.S.N.M.

Fig. 95 is another of the same type as fig. 94, in that it is a leaf-shaped, Class A, spear point and has the two notches near the base as if for ligatures, which is equally pronounced evidence of it having been intended for a knife or dagger. It is 2 inches wide and but five-sixteenths of an inch thick, so that it would be too fragile for a spearhead. Its edges are convex for the principal portion of the blade, but near the point they become concave, making the edge for the entire length a combination of concave and convex—an ogee. This has the effect of sharpening the point and giving it a needle form. This needle form is extremely rare, this being the only specimen remarked in the U. S. National Museum. The notch in the edges of a leaf-shaped implement pointed at both ends (Class A) is almost equally rare, as the two specimens here shown are the only ones we have. They are introduced not so much because of the rarity of their form as that it may assist in deciding the ultimate destination of the class of leaf-shaped implements to which they belong and which has never been satisfactorily determined. These specimens are from the eastern or middle United States and so have no relation with the long, thin blades from the Pacific coast.



LEAF-SHAPED ARROWPOINTS, SPEARHEADS, OR KNIVES.

Class B.

EXPLANATION OF PLATE 29.

1 2 3 4

LEAF-SHAPED ARROWPOINTS, SPEARHEADS, OR KNIVES.

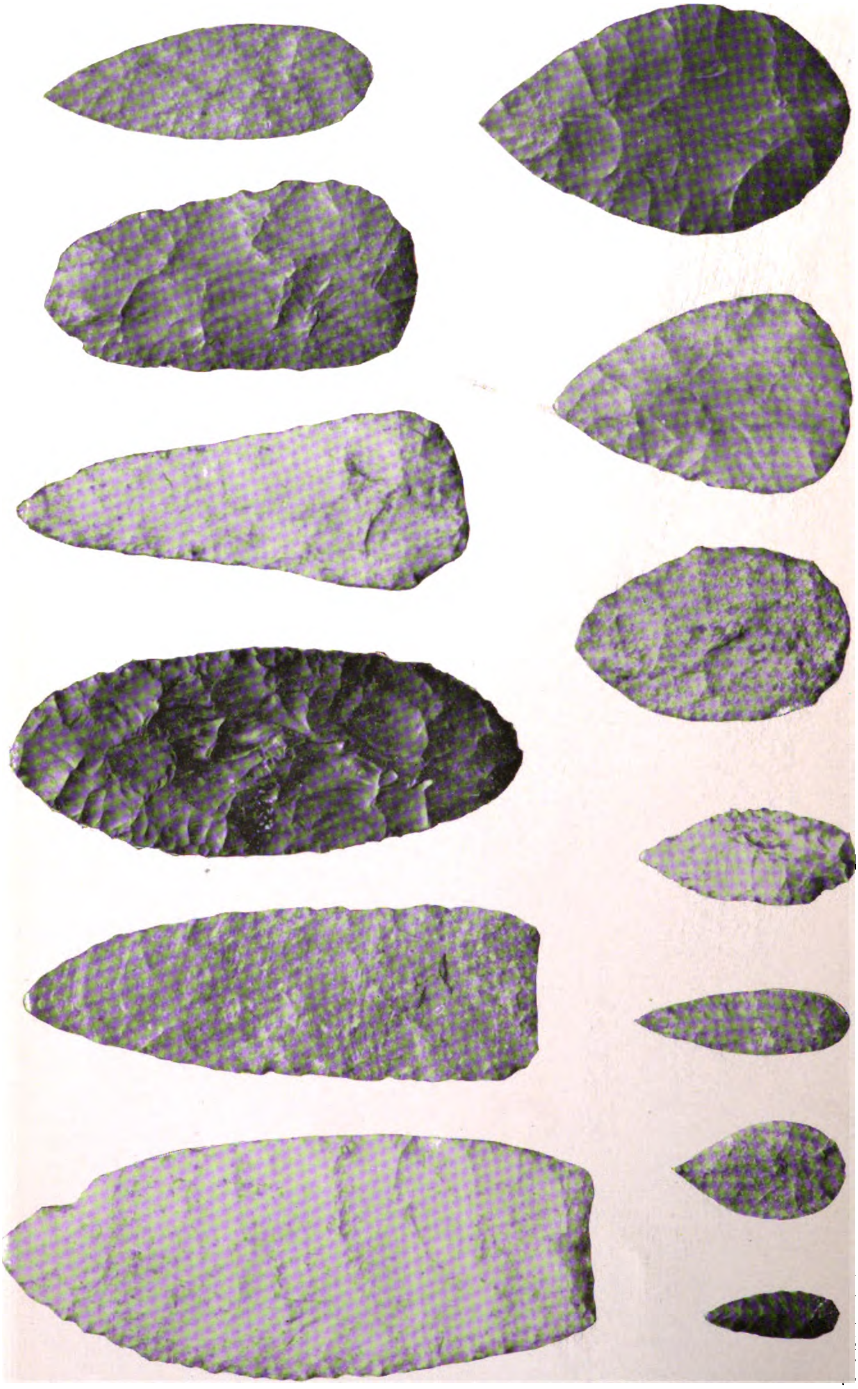
Class B.

Fig. 1. LEAD-COLORED QUARTZ PORPHYRY.
(Cat. No. 17999, U.S.N.M. Daysville, Windham County, Connecticut. J. H. Clark.)

Fig. 2. BLUE GRAY CHALCEDONY.
(Cat. No. 34584, U.S.N.M. Akron, Summit County, Ohio. Thomas Rhodes.)

Fig. 3. ARGILLITE.
(Cat. No. 19365, U.S.N.M. Trenton, New Jersey. Dr. C. C. Abbott.)

Fig. 4. RHYOLITE.
(Cat. No. 35009, U.S.N.M. Catawba County, North Carolina. J. T. Humphreys.)



LEAF-SHAPED ARROWPOINTS, SPEARHEADS, OR KNIVES.

Class B.

EXPLANATION OF PLATE 30.

1	2	3	4	5	6
13	12	11	9	8	7

LEAF-SHAPED ARROWPOINTS, SPEARHEADS, OR KNIVES.

Class B.

Fig. 1. WHITE CHERT.
(Cat. No. 99312, U.S.N.M. Boone County, Missouri. G. W. Clemens.)

Fig. 2. QUARTZ PORPHYRY.
(Cat. No. 36912, U.S.N.M. Catawba County, North Carolina. J. T. Humphreys.)

Fig. 3. YELLOW JASPER.
(Cat. No. 98438, U.S.N.M. (Chenati Mountains, Presidio. Texas. T. R. Stewart.)

Fig. 4. PINKISH-WHITE FLINTY CHERT.
(Cat. No. 99336, U.S.N.M. Boone County, Missouri. G. W. Clemens.)

Fig. 5. DARK-BROWN FLINTY CHERT.
(Cat. No. 22173, U.S.N.M. Cattaraugus County, New York. Mrs. L. N. Wright.)

Fig. 6. FINE CHERT, COLOR OF BEESWAX.
(Cat. No. 15753, U.S.N.M. San Miguel Island, California. W. G. Harford.)

Fig. 7. BLUISH-BROWN CHERTY FLINT.
(Cat. No, 42960, U.S.N.M. Paxton, Sullivan County, Indiana. J. W. Spencer.)

Fig. 8. GRAY CHALCEDONIC FLINT.
(Cat. No. 8234, U.S.N.M. Ohio. J. H. Devereux.)

Fig. 9. FINE-GRAINED QUARTZITE.
(Cat. No. 8563, U.S.N.M. Mound near Fort Wadsworth, Dakota. Dr. J. A. Comfort, U. S. A.)

Fig. 10. BRILLIANT-WHITE CHALCEDONY.
(Cat. No. 29683*a*. U.S.N.M. San Miguel Island, California. Stephen Bowers.)

Fig. 11. SHINING-PINKISH CHALCEDONY.
(Cat. No. 29685, U.S.N.M. San Miguel Island, California. Stephen Bowers.)

Fig. 12. WHITISH-GRAY OPALESCENT QUARTZ.
(Cat. No. 29683*b*, U.S.N.M. San Miguel Island, California. Stephen Bowers.)

Fig. 13. BLACK BASALT (?).
(Cat. No. 15760, U.S.N.M. San Miguel Island, California. W. G. Harford.)

Figs. 96 to 101, inclusive, are inserted for the purpose of completing the series and are not specially mentioned. The material, size, locality, etc., are given in their accompanying legends.

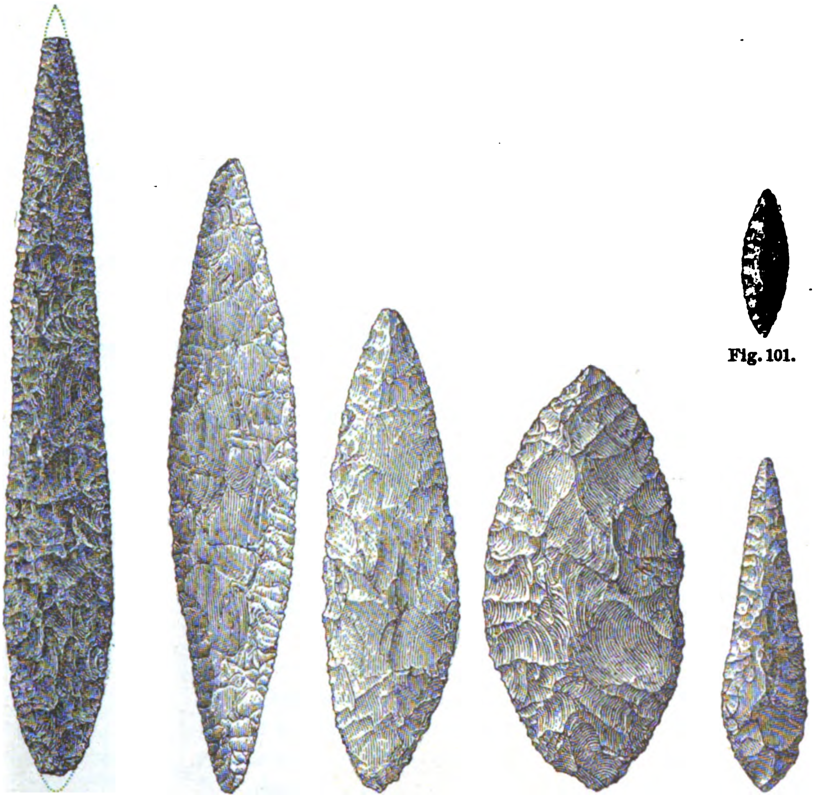


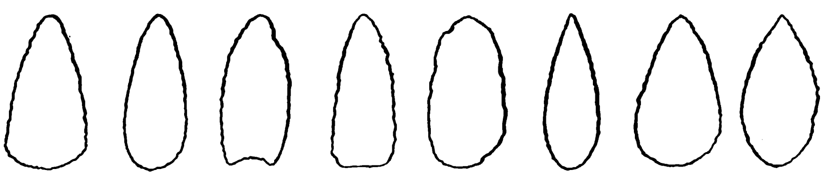
Fig. 101.

Fig. 96. Fig. 97. Fig. 98. Fig. 99. Fig. 100.

LEAF-SHAPED ARROWPOINTS, POINTED AT BOTH ENDS. DIVISION I, CLASS A.

Fig. 96.—Obsidian, $4\frac{1}{4} \times 1\frac{1}{3} \times \frac{3}{8}$, Stockton, California. Cat. No. 32363, U.S.N.M.
Fig. 97.—Pale gray flint, $6\frac{3}{4} \times 1\frac{3}{8} \times \frac{5}{16}$, Hardin County, Ohio. Cat. No. 9784, U.S.N.M.
Fig. 98.—Flinty chert, $5\frac{1}{4} \times 1\frac{1}{3} \times \frac{3}{8}$, Oregon. Cat. No. 21743, U.S.N.M.
Fig. 99.—Dark brown jasper, $4\frac{1}{8} \times 2\frac{1}{8} \times \frac{1}{2}$, Trinity, Louisiana. Cat. No. 6633, U.S.N.M.
Fig. 100.—Yellowish brown jasper, $3\frac{5}{8} \times 1 \times \frac{1}{4}$, District of Columbia. Cat. No. 5406, U.S.N.M.
Fig. 101.—Gray flint, $1\frac{3}{4} \times \frac{1}{2} \times \frac{3}{16}$, San Miguel Island, California. Cat. No. 15760, U.S.N.M.

CLASS B.—POINTED AT ONE END; CONCAVE, STRAIGHT, OR CONVEX BASE. (Plates 29, 30.)



These have the same general appearance as Class A. They may be oblong, oval, or ovate, with truncated base, concave, straight, or convex. They are usually larger, and are the commoner form of the leaf-shaped

in the United States. The large argillite specimens from Trenton, New Jersey, found by Dr. C. C. Abbott, belong to this class. These are exceedingly interesting and deserve profound study, as they may prove the connecting link between the Paleolithic and Neolithic periods in the United States. It will be remembered how the leaf-shaped implements were common to both periods. These are of argillite, the material used exclusively for the Trenton implements in the glacial gravels of the Delaware.

Fig. 102.

LEAF-SHAPED IMPLEMENT OF ARGILLITE, WITH STRAIGHT BASE.

Trenton, New Jersey.

Division I, Class B. 5⅜ x 2$\frac{9}{16}$ x ⅜.

Cat. No. 19367, U.S.N.M.

Fig. 102 is one of these argillite leaf-shaped implements found by Dr. Abbott at Trenton. Its shape is shown in the illustration. One of these specimens is photographed in the classification, leaf-shaped, Class B (Plate 29, fig. 3). The material seems to have been easily chipped; it could be struck off in broad, thin flakes, shell-shaped, and not long, straight, and narrow as with flint, obsidian, and other chippable materials. Therefore, the chipping appears gross, yet the desideratum of a thin, sharp implement is obtained.

Fig. 103 is another of the same material and from the same locality. The same remark is to be made as to its flakes.

Fig. 103.

LEAF-SHAPED IMPLEMENT OF ARGILLITE, WITH STRAIGHT BASE.

Trenton, New Jersey.

Division I, Class B.

4⅞ x 2⅜ x ⅜.

Cat. No. 19363, U.S.N.M.

Fig. 104 is from Paxton, Sullivan County, Indiana. Comparison of these three objects will manifest the difference in the chipping of the material. Although the surface of the latter (fig. 104) is much smaller than that of the former, yet the number of flakes struck from it is three times greater. The argillite specimens (figs. 102, 103) have, respectively, but 12 and 13 flakes struck from the broad side; the jaspery flint (fig. 104) has no less than 40. The argillite, contrary to its appearance, is quite hard, and takes and holds a fairly sharp edge; altogether, it was a good material and recommended itself for stone implements.

Figs. 105 and 106 represent specimens of leaf-shaped implements from Ohio. They are of flint, and, while sharp at the point, are so convex at the base as to pass gradually into the disk form so plentiful

in their locality. These formed part of a cache of 201 specimens found in 1872 by S. W. Briggs in Sullivan Township, Ashland County, about 18 inches beneath the surface, deposited in a keg-like vessel of the bark of the red elm, 10 or 12 inches in diameter and 13 inches in height. The specimens average in size from 4 inches long, 2 to $2\frac{3}{4}$ inches wide, and three-eighths of an inch thick.

Fig. 107 is a beautiful specimen, as delicate as though it had been intended for use in a lady's dressing case. It is but one-eighth of an inch thick. It is of dark-gray lustrous flint, with a patina similar to that on the Chelléen implements from the gravels of the rivers Somme and Ouse in Europe.

The late Paul Schumacher found such leaf-shaped points in southern California graves under circumstances which remove all doubts as to their having been the armatures of arrows. He saw, moreover, among the Indians of Oregon, arrows tipped with leaf-shaped flint points. (Rau.)

Fig. 104.
LEAF-SHAPED IMPLEMENT OF PALE GRAY JASPERY FLINT, WITH CONVEX BASE.
Division I, Class B.
$5 \times 1\frac{5}{8} \times \frac{5}{16}$.
Cat. No. 42957, U.S.N.M.

Fig. 105.
LEAF-SHAPED IMPLEMENT OF DARK GRAY FLINT, WITH CONVEX BASE.
Division I, Class B.
$4 \times 2\frac{1}{4} \times \frac{1}{4}$.
Cat. No. 15257, U.S.N.M.

Fig. 106.
LEAF-SHAPED IMPLEMENT OF DARK GRAY FLINT, WITH CONVEX BASE.
Division I, Class B.
$3 \times 2\frac{5}{8} \times \frac{5}{16}$.
Cat. No. 15258, U.S.N.M.

Fig. 108, from Santa Barbara County, California, is a peculiar, long, thin, narrow blade, with a sharp point, and, interesting to remark, its base shows traces of asphaltum or bitumen, by which its shaft or handle was attached. This demonstrates the mode of attachment, but does not aid in the solution whether it was intended for use as a knife or an arrow; that, the shaft or handle alone could determine.

Fig. 109, knife or arrowpoint, is even longer and thinner than the former (fig. 108).

Fig. 110 is of the same general type and from the same general locality. The patina is apparent. Fig. 111 has the same general appearance as fig. 107, but is broader and more oval. Its edges near the point are made concave, so that the point is more delicate and pronounced.

Fig. 112 is a beautiful specimen of translucent chalcedony, and is wrought to a true and even edge by almost infinitesimal flaking. The point and edges one-third way up are smoothed as if by use, not polished, but as though the sharpness of the edge had been worn off. It is a fine specimen.

Fig. 107.
LEAF-SHAPED IMPLEMENT OF DARK GRAY FLINT, WITH CONVEX BASE.
San Miguel Island, California.
Division I, Class B.
$1\frac{3}{4} \times \frac{5}{8} \times \frac{1}{8}$.
Cat. No. 29685, U.S.N.M.

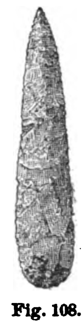


Fig. 108.
LEAF-SHAPED IMPLEMENT OF JASPERY GRAYISH FLINT, WITH CONVEX BASE.
Division I, Class B.
$3 \times \frac{9}{16} \times \frac{3}{16}$.
Cat. No. 20516, U.S.N.M.

Fig. 113 is of porphyritic felsite, which forms so large a portion of the material for prehistoric implements from eastern Massachusetts. Fig. 114 is of reddish quartzite, fine-grained and hard. It is from Rhode Island, and has convex edges and a straight base. Fig. 115 was found at Chattanooga in Tennessee by Messrs. Read and Dayton, but is of the white flint which belongs to Illinois and Missouri, and is a form common to those Western States. It is widest near the base, and from the place of its greatest expansion to the point the edges are straight, and not convex as usual. Fig. 116, from Knox County, Illinois, is of the pale-gray flint with the lustrous chalcedonic appearance common to that State. It is deeply weathered, especially at the two ends, where it is thin. Fig. 117 is elliptical and symmetrical. The edges are smooth and sharp, with fine chipping of long and regular shell-like flakes reaching from the edge to the center ridge. It is a specimen of the most difficult flint chipping in the Museum. There are 48 flakes shown on the two sides. They are one-half to five-eighths of an inch in width and $1\frac{1}{8}$ to $1\frac{1}{4}$ inches in length, and are scarcely thicker than parchment. Such fine work is beyond the skill of any one known to historic times. This specimen was found by Mr. John G. Henderson, of Winchester, Illinois, in a burial mound near Naples, Illinois, associated with numerous curious objects—copper hatchets, elaborate pipes, Pyrula shells, etc.—and is described by him.[1] Fig. 118 is of yellow jasper, of oval form, with con-

Fig. 109.
LEAF-SHAPED IMPLEMENT OF OBSIDIAN, WITH CONVEX BASE.
San Miguel Island, California.
Division I, Class B.
$3\frac{3}{8} \times \frac{9}{16} \times \frac{1}{8}$.
Cat. No. 26426, U.S.N.M.

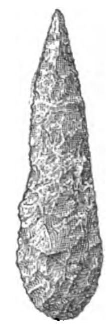


Fig. 110.
LEAF-SHAPED IMPLEMENT OF LUSTROUS CHALCEDONIC FLINT OR SILICIFIED WOOD, WITH CONVEX BASE.
San Miguel Island, California.
Division I, Class B.
$3\frac{1}{4} \times \frac{7}{8} \times \frac{5}{16}$.
Cat. No. 15784, U.S.N.M.

[1] Smithsonian Report, 1882, p. 696, fig. 11.

vex edges and straight base, more than usual thickness, rude appearance. The large and irregular flaking marks it as something different from the former specimens. Its plane is twisted nearly one-half an inch. There is no evidence of use. Fig. 119 is leaf-shaped, convex but not rounded base, broad in proportion, with convex edges and sharp point.

Fig. 120 is pale blue, almost white, chalcedonic flint, from Flint Ridge, Licking County, Ohio. The characteristic small quartz crystals are to be seen on its surface. Its base and edges are both convex, as shown in the illustration. The edges all around have been chipped so thin that the light will show through. Dr. Rau has said this was probably a knife, and it may have been, but there is nothing except its comparative width to indicate anything different from any other implement of the same class, and what it might have been is determinable only by the shaft or handle. If it had a long shaft, then this was an arrow or spear; if a short handle, then it was a knife; and as to which it had we know nothing, either by direct or circumstautial evidence. Figs. 121 to 123 are specimens belonging to this class, but have no particular characteristics. They are inserted for the purpose of completing the series. Their material, size, and locality are given at length in their legends.

Fig. 111.

LEAF-SHAPED IMPLEMENT OF PALE GRAY CHALCEDONIC FLINT WITH CONVEX BASE.

San Miguel Island, Califoruia.

Division I, Class B.

1⅝ x ⅞ x ¼.

Cat. No. 29683, U.S.N.M.

Fig. 112.

LEAF-SHAPED IMPLEMENT OF TRANSLUCENT CHALCEDONY, WITH STRAIGHT BASE.

Tennessee.

Division I, Class B.

9 x 3 x ⅝.

Cat. No. 6801, U.S.N.M.

Fig. 113.

LEAF-SHAPED IMPLEMENT OF PORPHYRITIC FELSITE, WITH CONVEX BASE.

Dartmouth, Bristo County, Massachusetts

Division I, Class B.

4½ x 2 x ½.

Cat. No. 18015, U.S.N.M.

Fig. 114.

Fig. 115.

Fig. 116.

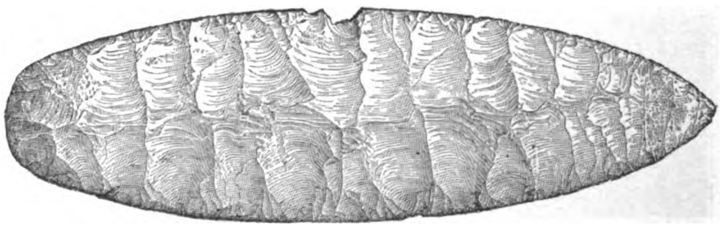


Fig. 117.

Fig. 118.

LEAF-SHAPED IMPLEMENTS. DIVISION I, CLASS B.

Fig. 114.—Straight base. 1¾ x ¾ x ⅜. Kingston, Rhode Island. Cat. No. 18018, U.S.N.M.
Fig. 115.—White flint, with straight base. 3¾ x 1⅜ x ⅝. Cat. No. 5947, U.S.N.M.
Fig. 116.—Convex base. 2¾ x 1¼ x ¼. Cat. No. 31987, U.S.N.M.
Fig. 117.—Dark-gray flint, with convex base. 7⅜ x 2¼ x ⅜. Mound near Naples, Illinois. Cat. No. 43133, U.S.N.M.
Fig. 118.—Straight base. 4¼ x 2⅜ x ⅝. Piscataway, Maryland. Cat. No. 5833, U.S.N.M.

Fig. 119.

Fig. 120.

Fig. 121.

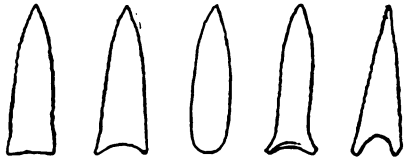
Fig. 122.

Fig. 123.

LEAF-SHAPED IMPLEMENTS. DIVISION I, CLASS B.

Fig. 119.—Pale-gray chert, with convex base. 2⅛ x 1⅜ x ¼. Texas. Cat. No. 2404, U.S.N.M.
Fig. 120.—Convex base. 3¼ x 1⅞ x ¼. Cat. No. 8234, U.S.N.M.
Fig. 121.—Pale-gray chalcedonic flint, with convex base. 2¾ x 1⅞ x ¼. Flint Ridge, Licking County, Ohio. Cat. No. 8234*a*, U.S.N.M.
Fig. 122.—Dark lustrous pyromachic flint, with convex base. 5⅛ x 2¼ x ⅜. Flint Ridge, Licking County, Ohio. Cat. No. 16461, U.S.N.M.
Fig. 123.—Light-gray flint, with straight base. 2⅜ x 1⅜ x ¼. Ohio. Cat. No. 11197, U.S.N.M.

CLASS C.—LONG, NARROW BLADES WITH STRAIGHT, PARALLEL EDGES, SHARP POINTS, BASE CONCAVE, STRAIGHT, OR CONVEX. (Plate 31.)



This class accommodates the long, narrow blades from the Pacific coast. This variety can be studied in Plate 31, leaf-shaped, Class C. Their sides and edges are straight, and parallel with each other, or nearly so. The convex deflection from a straight line by which the point is formed, may be abrupt or gentle according as the point is made blunt or tapering. The base may be either concave, straight, or convex; there seems to have been no regularity concerning it. In every case it is made by the regular chipping. The specimens vary greatly in length and width, but all are extremely thin, being from one-eighth to three-eighths, never more than one-half inch. The difference between width and length is greater than in any other class. The specimens on the plate show the following extremes: No. 1, $8\frac{3}{4}$ by $1\frac{3}{4}$ by $\frac{5}{16}$ inches; No. 7, 3 by $\frac{7}{8}$ by $\frac{3}{16}$ inches; No. 8, $3\frac{3}{4}$ by $\frac{7}{16}$ by $\frac{3}{16}$ inches; No. 13, $1\frac{7}{8}$ by $\frac{1}{2}$ by $\frac{1}{8}$ inches.

The materials of the implements of this class are agate, chalcedony, flint in its purer condition, obsidian, and similar fine material. These materials are susceptible of delicate chipping, and the prehistoric workmen have employed their opportunity with the result of elegant and beautiful specimens. The usual remark is to be made as to their

a b

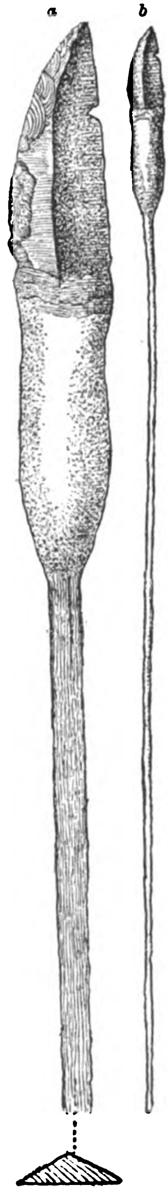


Fig. 124.

NEW CALEDONIAN JAVELIN (MODERN).

Sir John Lubbock, "Prehistoric Times." a, ½ natural size; b, ⅛ natural size.

Fig. 125.

LEAF-SHAPED IMPLEMENT OF BROWNISH-GRAY JASPER, WITH CONCAVE BASE AND PARALLEL EDGES.

Santa Barbara County, California.

Division I, Class C.

$8\frac{3}{4}$ x $1\frac{3}{4}$ x $\frac{3}{8}$.

Cat. No. 21632, U.S.N.M.

EXPLANATION OF PLATE 31.

1	2	3	4	5	6	7
	13	12	11	10	9	8

Leaf-shaped Arrowpoints, Spearheads, or Knives.

Class C, Pacific Coast.

Fig. 1. Opalescent Chert.
(Cat. No. 21632, U.S.N.M. Santa Barbara County, California. Paul Schumacher.)

Fig. 2. Opalescent Chert.
(Cat. No. 62484, U.S.N.M. Dos Pueblos, Santa Barbara County, California. Capt. G. M. Wheeler, U. S. Geological Survey.)

Fig. 3. Pinkish Slate.
(Cat. No. 8927, U.S.N.M. West Derby, Vermont. H. W. Norris.)

Fig. 4. Black Chalcedony.
(Cat. No. 62481, U.S.N.M. Dos Pueblos, Santa Barbara County, California. Capt. G. M. Wheeler.)

Fig. 5. Obsidian.
(Cat. No. 25424, U.S.N.M. San Miguel Island, California. Stephen Bowers.)

Fig. 6. Gray Chalcedony.
(Cat. No. 171441, U.S.N.M. Burke County, Georgia. Dr. R. Steiner.)

Fig. 7. Brownish Flint.
(Cat. No. 171441, U.S.N.M. Burke County, Georgia. Dr. R. Steiner.)

Fig. 8. White Chert.
(Cat. No. 23674, U.S.N.M. Santa Rosa Island, California. Stephen Bowers.)

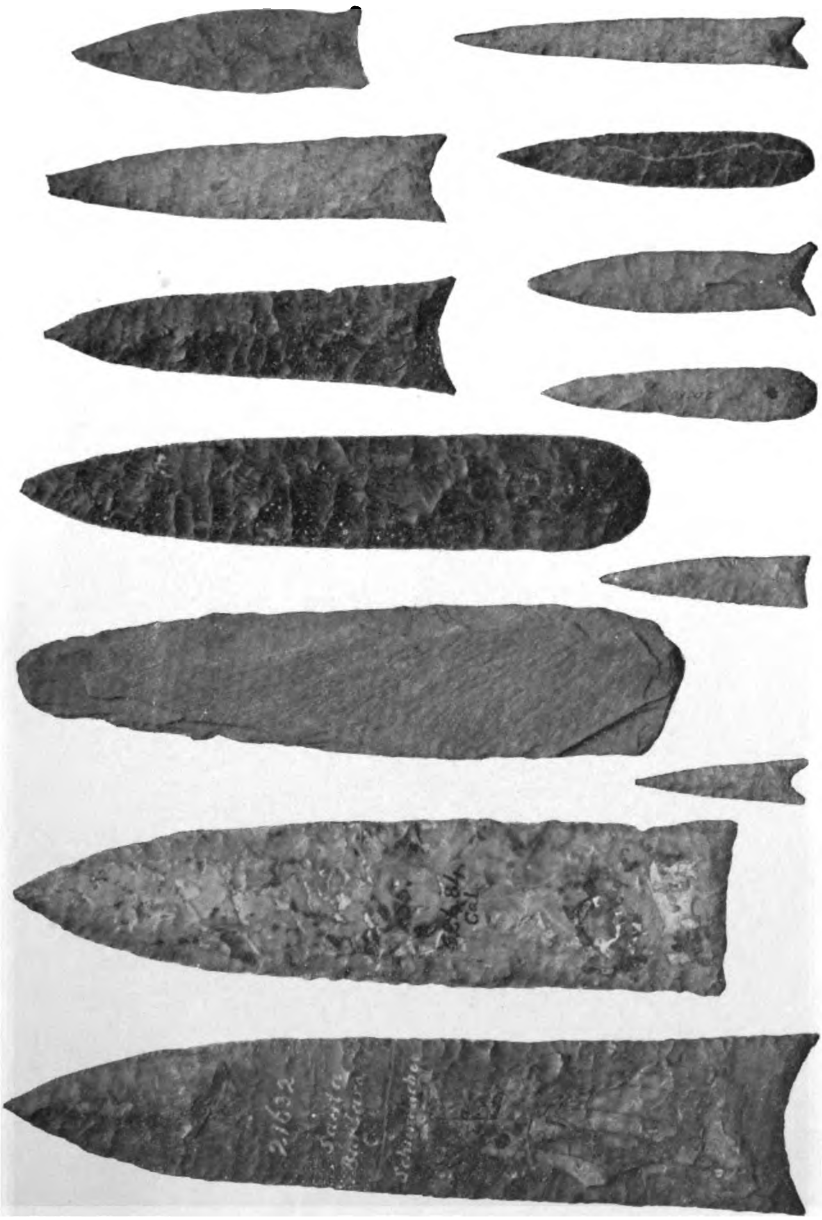
Fig. 9. Black Flinty Chalcedony. Bitumen on stem, evidence of a handle.
(Cat. No. 26426, U.S.N.M. San Miguel Island, California. Stephen Bowers.)

Fig. 10. Yellowish Flint.
(Cat. No. 171441, U.S.N.M. Burke County, Georgia, Dr. R. Steiner.)

Figs. 11. Grayish Flint.
(Cat. Nos. 20516, U.S.N.M. Santa Barbara County, California. Paul Schumacher.)

Fig. 12. Grayish Flint.
(Cat. No. 26415, U.S.N.M. San Miguel Island. Stephen Bowers.)

Fig. 13. Grayish Flint.
(Cat. No. 15761, U.S.N.M. Santa Barbara County, California. Paul Schumacher.)



LEAF-SHAPED ARROWPOINTS, SPEARHEADS, OR KNIVES.

Class C.

Pacific coast.

having been used as arrowpoints, spearheads, or knives. Many of them are so wrought that they could not have been held in the hand unprotected. For example, those with sharp corners made by the concave or square bases would be needless if the implements were to be without a handle. That they were used with handles is proved by the asphaltum or bitumen still adhering to the base for a perceptible distance up the blade, as shown in figs. 107 and 130. This evidence of handling is not confined to one size or kind of these implements, nor to one locality. Fig. 108 is but $3\frac{3}{4}$ inches long

Fig. 126.

LEAF-SHAPED IMPLEMENT OF GRAY FLINT OR JASPER, WITH STRAIGHT BASE AND PARALLEL EDGES.

Santa Barbara County, California.

Division I, Class C.

$7\frac{3}{4}$ x 2 x $\frac{3}{16}$.

Cat. No. 21631, U.S.N.M.

Fig. 127.

LEAF-SHAPED IMPLEMENT, WITH CONCAVE BASE AND PARALLEL EDGES.

California.

Division I, Class C.

$10\frac{1}{8}$ x $1\frac{1}{4}$ x $\frac{1}{4}$.

Cat. No. 21626, U.S.N.M.

Fig. 128.

LEAF-SHAPED IMPLEMENT OF LUSTROUS FLINT OR CHALCEDONY, WITH SLIGHTLY CONCAVE BASE AND PARALLEL EDGES.

California.

Division I, Class C.

Cat. No. 62484, U.S.N.M.

and seven-sixteenths of an inch wide, while fig. 130 measures 10 by $1\frac{1}{4}$ by three-eighths inches. In the chapter on knives we will revert to these specimens and show them with their handles attached with bitumen.

Fig. 124, a specimen of modern spear of obsidian flakes from New Caledonia, attached to a thin handle or shaft by means of gum, bitumen, or asphalt, and, taken from Sir John Lubbock's Prehistoric Times, is inserted for comparison.

Fig. 129.

LEAF-SHAPED IMPLEMENT OF LUSTROUS FLINT OR CHALCEDONY, WITH CONCAVE BASE AND PARALLEL EDGES.

California.

Division I, Class C.

$5\frac{3}{4} \times 2 \times \frac{3}{16}$.

Cat. No. 21628, U.S.N.M.

Fig. 125 is an extremely thin, finely chipped object, from Santa Barbara County, California, and is a sample of those from the Pacific coast. We are to remark the long, narrow blade, the parallel edges, the fine material, the delicate chipping, and the extreme thinness as peculiarities of these implements from this locality. The specimens on Plate 31 will serve as further illustrations.

Fig. 126 is another of the long, narrow, and thin flint or jasper implements from the Pacific coast. Although it is $7\frac{3}{8}$ inches long and 2 inches wide, it is but one-eighth of an inch thick. It, with two or three other specimens, is peculiar in that, though thin, they have not been reduced by chipping. They are quite flat in section, reduced in thickness only to form the edge. This peculiarity is caused by the layer of flint being of natural formation in its present thickness. The deposit of flint, however made, has been intercalated with a layer on each side of what has the appearance of lime or chalk, the surface being broken by right lines into parallelogramic figures, as shown in the illustration. Only slight chipping was necessary to reduce the implement to a sharp edge. For the better understanding of this, reference is made to Plate 31, fig. 2.

Fig. 130.

LEAF-SHAPED IMPLEMENT OF BLACK FLINT, WITH CONCAVE BASE AND PARALLEL EDGES.

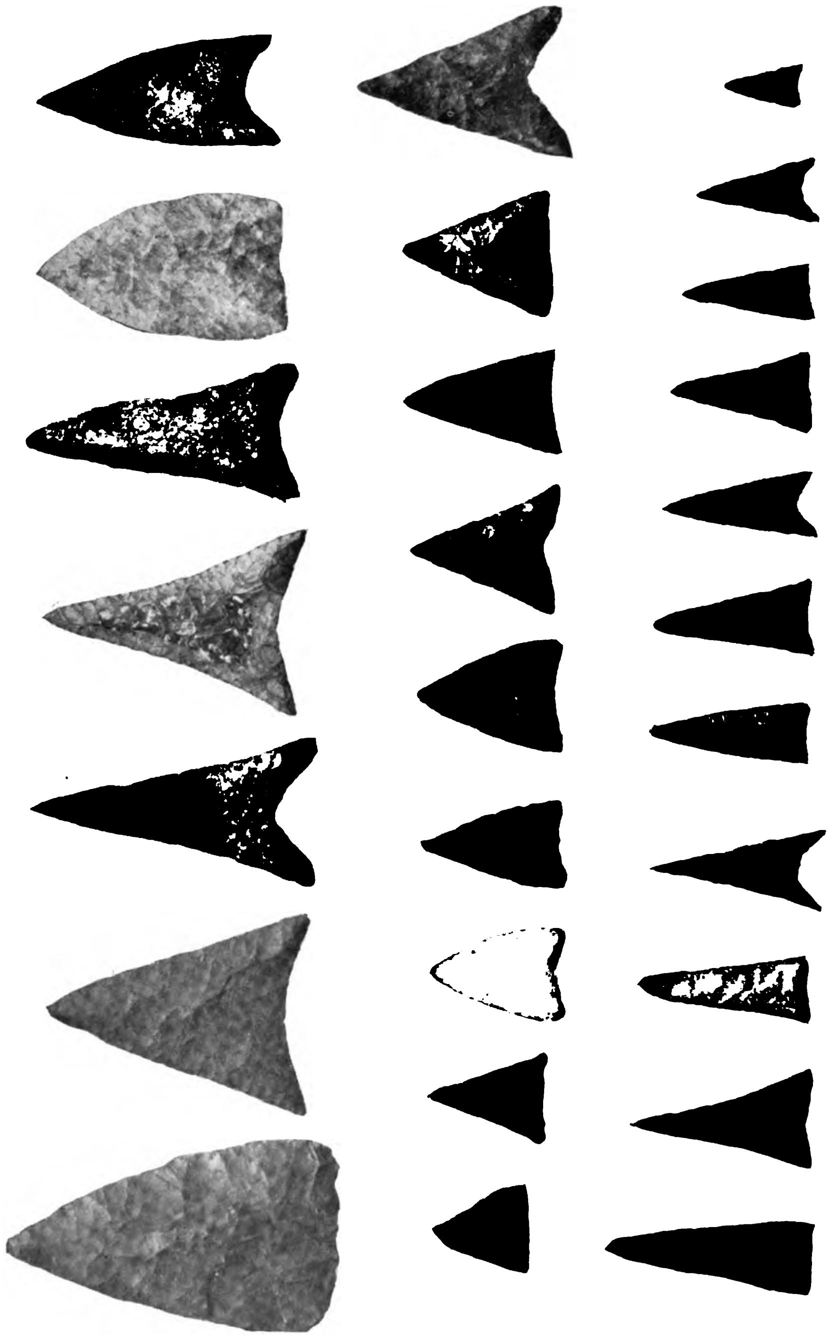
California.

Division I, Class C.

$10 \times 1\frac{1}{4} \times \frac{3}{8}$.

Cat. No. 69488, U.S.N.M.

Fig. 127 is the longest, thinnest, and narrowest of these leaf-shaped objects from the Pacific coast. Its edges are parallel for nearly the entire length. It is slightly thicker nearer the base, which is strongly concave. It is of gray flint or jasper, and has been deposited in the strata mentioned in the description of fig. 126, of which traces are shown in the illustration. The edges have been wrought by chipping, and they, with the point and barbs, are fine and sharp.



TRIANGULAR ARROWPOINTS, SPEARHEADS, OR KNIVES.

EXPLANATION OF PLATE 32.

1	2	3	4	5	6	7				
16	15	14	13	12	11	10	9	8		
17	18	19	20	21	22	23	24	25	26	27

TRIANGULAR ARROWPOINTS, SPEARHEADS, OR KNIVES.

Fig. 1. GREEN CHALCEDONY.
(Cat. No. 18048. U.S.N.M. Westerly, Washington County, Rhode Island. J. H. Clark.)

Fig. 2. GREENISH FLINT.
(Cat. No. 18057, U.S.N.M. Cumberland, Providence County, Rhode Island. J. H. Clark.)

Fig. 3. YELLOW FLINT.
(Cat. No. 171438, U.S.N.M. Waynesboro, Burke County, Georgia. Dr. R. Steiner.)

Fig. 4. GRAY FLINT.
(Cat. No. 6177, U.S.N.M. Stillwater, Washington County, New York. Col. E. Jewett.)

Fig. 5. BLUE-BLACK FLINT.
(Cat. No. 171438*a*, U.S.N.M. Waynesboro, Georgia. Dr. Roland Steiner.)

Fig. 6. LIGHT-GRAY FLINT.
(Cat. No. 11107, U.S.N.M. Milnersville, Guernsey County, Ohio. D. T. Thompson.)

Figs. 7, 8. YELLOW FLINT.
(Cat. Nos. 171438*b*, 171438*c*, U.S.N.M. Waynesboro, Georgia. Dr. Roland Steiner.)

Fig. 9. PORPHYRITIC FELSITE.
(Cat. No. 18060, U.S.N.M. Nantucket Island, Massachusetts. J. H. Clark.)

Fig. 10. FINE-GRAINED QUARTZITE.
(Cat. No. 18034, U.S.N.M. Chilmark, Dukes County, Massachusetts. J. H. Clark.

Fig. 11. DARK-GRAY FLINT.
(Cat. No. 31587, U.S.N.M. Bainbridge, York County, Pennsylvania. F. G. Gailbraith.)

Fig. 12. QUARTZ PORPHYRY.
(Cat. No. 18021, U.S.N.M. Wickford, Washington County, Rhode Island. J. H. Clark.)

Fig. 13. LIGHT-BROWN FLINT.
(Cat. No. 10004, U.S.N.M. Camden County, Georgia. Gen. C. R. Floyd.)

Fig. 14. WHITE QUARTZ.
(Cat. No. 18033, U.S.N.M. Essex, Middlesex County, Connecticut. J. H. Clark.)

Fig. 15. DARK-GRAY FLINT.
(Cat. No. 113819, U.S.N.M. Kanawha County, West Virginia. Bureau of Ethnology. P. W. Norris.)

Fig. 16. DARK-GRAY FLINT.
(Cat. No. 18031, U.S.N.M. East Haddon, Middlesex County, Connecticut. J. H. Clark.)

Fig. 17. GRAY CHERT.
(Cat. No. 22175, U.S.N.M Sheridan, Chautauqua County, New York. N. Gould.)

Fig. 18. BLACK FLINT.
(Cat. No. 18086, U.S.N.M. Mound in Ohio. J. H. Clark.)

Fig. 19. WHITE FLINT.
(Cat. No. 21921, U.S.N.M. Waukegan, Lake County, Illinois. J. W. Milner.)

Fig. 20. DARK-BROWN JASPER.
(Cat. No. 12744, U.S.N.M. Oregon. Paul Schumacher.)

Fig. 21. BLACK FLINT.
(Cat. No. 5315, U.S.N.M. Llano County, Texas. A. R. Roessler.)

Fig. 22. GREENISH FLINT.
(Cat. No. 32239, U.S.N.M. Catawba County, North Carolina. J. T. Humphrey.)

Fig. 23. VARIEGATED FLINT, BROWN AND GRAY.
(Cat. No. 29683, U.S.N.M. San Miguel Island, California, Stephen Bowers.)

Fig. 24. GRAY FLINT.
(Cat. No. 16471, U.S.N.M. Southern Ohio. Dr. C. A. Miller.)

Fig. 25. DARK FLINT.
(Cat. No. 29961, U.S.N.M. Louisburg, Franklin County, North Carolina. F. G. Foster.)

Fig. 26. BROWN JASPER.
(Cat. No. 20275, U.S.N.M. Oregon. Paul Schumacher.)

Fig. 27. WHITE CHERT.
(Cat. No. 136959, U. S. N. M. Labette County, Kansas. W. S. Hill.)

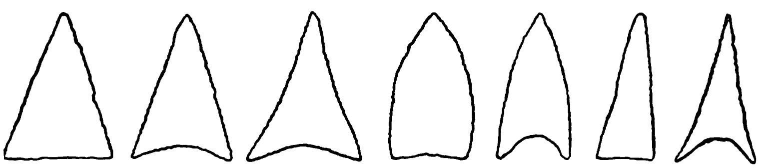
Figs. 128 and 129 (see Plate 31, fig. 2) belong to the same class. They are from the same locality, Santa Barbara County, California, and evidently the same material, which is stratified flint or chalcedony, lustrous, having the appearance of a brilliant patina. The edges are parallel and the bases slightly concave.

We now pass to an implement having sufficient resemblance to require its placement in Class C, and although from the same locality as the foregoing implement, it has such a difference of material, workmanship, and apparently of service, that its manufacture and use may have been separated from them by long time or distance or perhaps both. Two specimens of this kind are here shown (figs. 130, 131). They are from Dos Pueblos, Santa Barbara County, California, are of black flint, and bear traces (especially the larger, fig. 130) of bitumen having served as an attachment for a handle. (See p. 906 and fig. 124.)

Fig. 131.
LEAF-SHAPED IMPLEMENT OF BLACK FLINT, WITH CONVEX BASE AND PARALLEL EDGES.
California.
Division I, Class C.
7 x $1\frac{3}{8}$ x $\frac{5}{16}$.
Cat. No. 62481, U.S.N.M.

Fig. 130 represents an implement, 10 inches long and $1\frac{1}{4}$ inches wide, its edges being perfectly straight and parallel for $7\frac{1}{2}$ inches of the length, and of exquisite workmanship. Fig. 131, though not so large is equally as fine (Plate 31, fig. 4). The edges and points are smooth and sharp. The chipping by which they have been reduced has been fine, with small and delicate flakes running from the edge to the center ridge. An inspection of the illustrations will show the beauty of the work. Both specimens bear traces of the bitumen by which the shaft or handle was fastened.

DIVISION II—TRIANGULAR. (Plate 32.)



This division includes all arrowpoints or spearheads in the form of a triangle, whether the bases or edges be straight, convex, or concave. It might be that the concavity or convexity of the lines of the edges would, in strict geometrical nomenclature, exclude this from being called a triangle, but the author ignores this criticism and has kept the name given by many others and understood by all.

This class includes all kinds of triangles, whether equilateral or isosceles, and whatever may be the relation of length between the

lines of base and edge. The edges may be convex or concave and the base with an exaggerated concavity, the two corners forming barbs, the arrow shaft the stem (Plate 32, figs. 3, 8, 20, 23, 26). Some of these implements are extremely rude, especially those of quartz and of jasper, which are refractory material, but many of these have been delicately and finely chipped.

Triangular arrowpoints, while found in great profusion in some localities, are not nearly so numerous throughout the country as other divisions. They appear in greater numbers on the Atlantic coast than in the interior. Dr. Abbott says that in a series of 3,300 arrowpoints from Mercer County, New Jersey, 1,428 were triangular. Although this may be the simplest form of arrowpoint, yet the author doubts if that be evidence of its having had any precedence in manufacture, or that there was any evolution from it to other forms. That there may have been relationship is granted. The arrow maker may have made indifferently the triangular and leaf-shaped, and he may have changed from one to the other, dependent upon the peculiarities of the material and the success with which he was able to work it, and the question of fashion and custom can not be ignored. It is thought these reasons are sufficient to account for the infinite variety of shape in arrowpoints.

The author has laid down no hard and fast lines of division in this classification. Some of the leaf-shaped may have had their bases and edges straightened (Plate 30, fig. 8), and the triangular had their corners rounded until the two divisions came together (Plate 32, figs. 1, 6); so also with the leaf-shaped and the stemmed. Some of the former have been notched near the base and thus been changed to stemmed, and so on through the entire system. This classification is made for the student and for convenience of description; therefore there will be overlapping of the dividing lines between the classes, as will be readily seen by referring to Plate 32. This must be accepted unless we would make infinitesimal divisions and every slight difference in form make a separate class. So each division includes all forms which approach nearest to it, even if they have peculiarities which make it difficult to harmonize. Some of the peculiarities in the triangular division are to be noted. One is where the convexity of the edges continued to the base brings a close resemblance to Division I, leaf-shaped, Class B, (Plate 30, figs. 1, 6). Another is the widening just at the base, by which the implement takes on a slight bell shape (Plate 31, fig. 10); another is where the edges of the triangle do not come in a straight line nor yet in a curved line from the point to the base, but make an angle midway between the two and give the implement a pentagonal form rather than strictly triangular (fig. 178). A few of the triangular forms have serrated or beveled edges, though this is rare. Occasionally the barbs on one side are longer than the other. There is no rule for the concavity of the base; it varies from almost a straight line to a depth equal to one-third of the length of the implement.

Dr. Rau, in the paper already mentioned, gave expression to the possibility of the triangular implement not having been an arrowpoint, but that the point may have been intended for insertion in a handle, and the base, being sharp, intended for a cutting implement and to be used for a chisel. (See p. 887.)

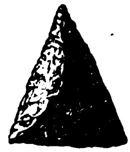


Fig. 132.
TRIANGULAR, EQUILATERAL ARROWPOINT.
Nantucket Island, Massachusetts.
Division II.
$1\frac{1}{8} \times 1\frac{1}{4} \times \frac{3}{8}$.
Cat. No. 18060, U.S.N.M.

Fig. 133.
TRIANGULAR ARROWPOINT OR SPEARHEAD, WITH STRAIGHT EDGES AND CONCAVE BASE.
Rhode Island.
Division II.
$2\frac{1}{8} \times 1\frac{15}{16} \times \frac{3}{16}$.
Cat. No. 18057, U.S.N.M.

However, the author does not subscribe to this opinion nor adopt the theory. He believes these were, of all others, plain, simple arrowpoints and never intended for anything else, except, possibly, that the heavier ones might have been attached to longer shafts and used as javelins. This would be practically the same use as an arrowpoint, and no one, not finding the shaft or knowing its size or length, could know from any inspection of the implement this difference in its use. He does not think it could have been used as a chisel, for none of them that he has ever seen show any marks of use at the base. The greater proportion of them, as has been said, have concave bases, and especially is this true of those with sharp edges. A chisel with a concave base is unknown in our study of prehistoric man, and one can scarcely suggest the necessity for an implement possessing this peculiarity, whether its use be by the Indian or the white man, historic or prehistoric. If thus used as a chisel, that which is now regarded as the point becomes the stem and is to be inserted into its handle; this would make a broad-ended chisel with a concave edge. A cutting edge of such width would give great purchase as against the handle, and if one should attempt to use these outside edges or corners after the manner of a chisel, the implement would be in danger of breaking out of its handle, or, if this was avoided, would require a stronger fastening than we could imagine that it ever received at the hands of the Indian. No handle fastened with a thong, sinew, cord, or even bitumen would ever be able to hold this implement handled in this way when used

Fig. 134.
TRIANGULAR ARROWPOINT OF GRAY FLINT, WITH CONCAVE EDGES AND BASE.
Stillwater, Washington County, New York.
Division II.
$2\frac{1}{8} \times 1\frac{7}{8} \times \frac{3}{16}$.
Cat. No. 6177, U.S.N.M.

Fig. 135.
TRIANGULAR ARROWPOINT, WITH CONCAVE BASE.
Chilmark, Massachusetts.
Division II.
$1\frac{1}{4} \times 1 \times \frac{3}{16}$.
Cat. No. 18045, U.S.N.M.

as a chisel. One has but to look at the modern chisel with its long steel tang well fitted and driven hard into a solid oak handle with a collar to receive the bottom of the handle, making the entire implement as firm in its handle as though it was all one piece. Watch the mechanic as he uses his chisel, strong and well-handled as it is, and see the purchase it has when used on the corners, and anyone will shortly understand the impossibility of the ancient handling being strong enough to stand this use. The same objection applies with equal force against the use of the implement as a knife, even when handled at the base as is the arrow. It would inevitably twist and slip and become loose in its handle, and so worthless. The author has, throughout this paper, contented himself with stating facts and has not advanced theories of his own nor argued those of others; but in the present case he thinks a consideration of the situation and an investigation of the surroundings will show that these implements were not used on their edges as cutting or sawing implements, either as chisels or knives, but solely for thrusting or striking with the point as arrows; but whether as arrows they were weapons of war or javelins for game he has no opinion, and no amount of examination of the object itself serves to elucidate the theory.

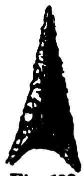


Fig. 136.
TRIANGULAR ARROWPOINT, DEEPLY CONCAVE.
Oregon.
Division II.
$1\frac{3}{4} \times \frac{3}{4} \times \frac{1}{8}$.
Cat. No. 12744, U.S.N.M.

(8233)
Fig. 137.
TRIANGULAR ARROWPOINT OF WHITE QUARTZ.
Division II.
$2\frac{1}{4} \times 2 \times \frac{1}{4}$.
Cat. No. 8233, U.S.N.M.

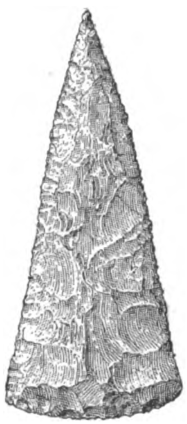


Fig. 138.
TRIANGULAR ARROWPOINT OF PALE GRAY FLINT, WITH CONVEX BASE.
St. George, Washington County, Utah.
Division II.
$4\frac{1}{4} \times 1\frac{7}{8} \times \frac{1}{8}$.
Cat. No. 20991, U.S.N.M.

Fig. 132 is almost an equilateral triangle. It is of the porphyritic felsite common to eastern Massachusetts, and is thick, heavy, and rudely made. Its point is sharp, but not the barbs. It is a good representation of the average and usual size and appearance of the triangular arrowpoint.

Fig. 133 is one of the larger triangular arrowpoints or spearheads. It is of dark-gray flint, almost black. Its edges are straight and its base concave, symmetrical from every view, delicately chipped to regular and smooth point, edges, barbs, and base.

Fig. 134 is quite thin, delicately chipped, showing very small serrations. The edges and base are concave. The points and barbs are fine and sharp. Fig. 135 is of white quartz, and for this material well and regularly chipped. It is quite symmetrical,

with sharp, smooth point and edges. These appear mostly on the Atlantic coast.

Fig. 136 is one of those elegant and minute arrowpoints which have made Oregon renowned in the world of archæology. It is dark-brown jasper, is triangular in form, with long, tapering point. Its edges are very slightly concave, but the base is so deeply concave that the corners form long, slender barbs. Other specimens from the same locality have notches on the edges near the base, by means of which the sinew or cord fastens the head to its shaft, but this, and indeed none of the triangulars, have any such contrivance.

Fig. 137 is one of the triangular forms from Massachusetts. It is rude and irregular on edges and base.

Fig. 138, although with an elongated point, yet is to be classed as triangular. It is a marvel of flint chipping. Four and a quarter inches long and 1⅝ inches wide, it is nowhere more than one-eighth of an inch in thickness. This is as thin as any specimen can be expected. The base of this specimen is slightly convex; the edges are nearly straight. They and the point are fine and sharp.

Some of the specimens from the Pacific coast, figured in leaf-shaped, Class C, are as thin as this, but, as described, this was their natural thickness. They were separated from each other by a deposit of extraneous matter. This specimen is not of such formation. It has been wrought out of a solid block of flint, and was effected by those broad and thin flakes so often found, running from the edge, the point of pressure, to the center, widening into the form of a shell, and reducing the thickness of the implement almost as much at the center as at the edge. This system is the perfection of flint chipping. It shows a high degree of manual dexterity, and is one of the lost arts, for no workman known in historic times has been able to reproduce it.

DIVISION III—STEMMED.

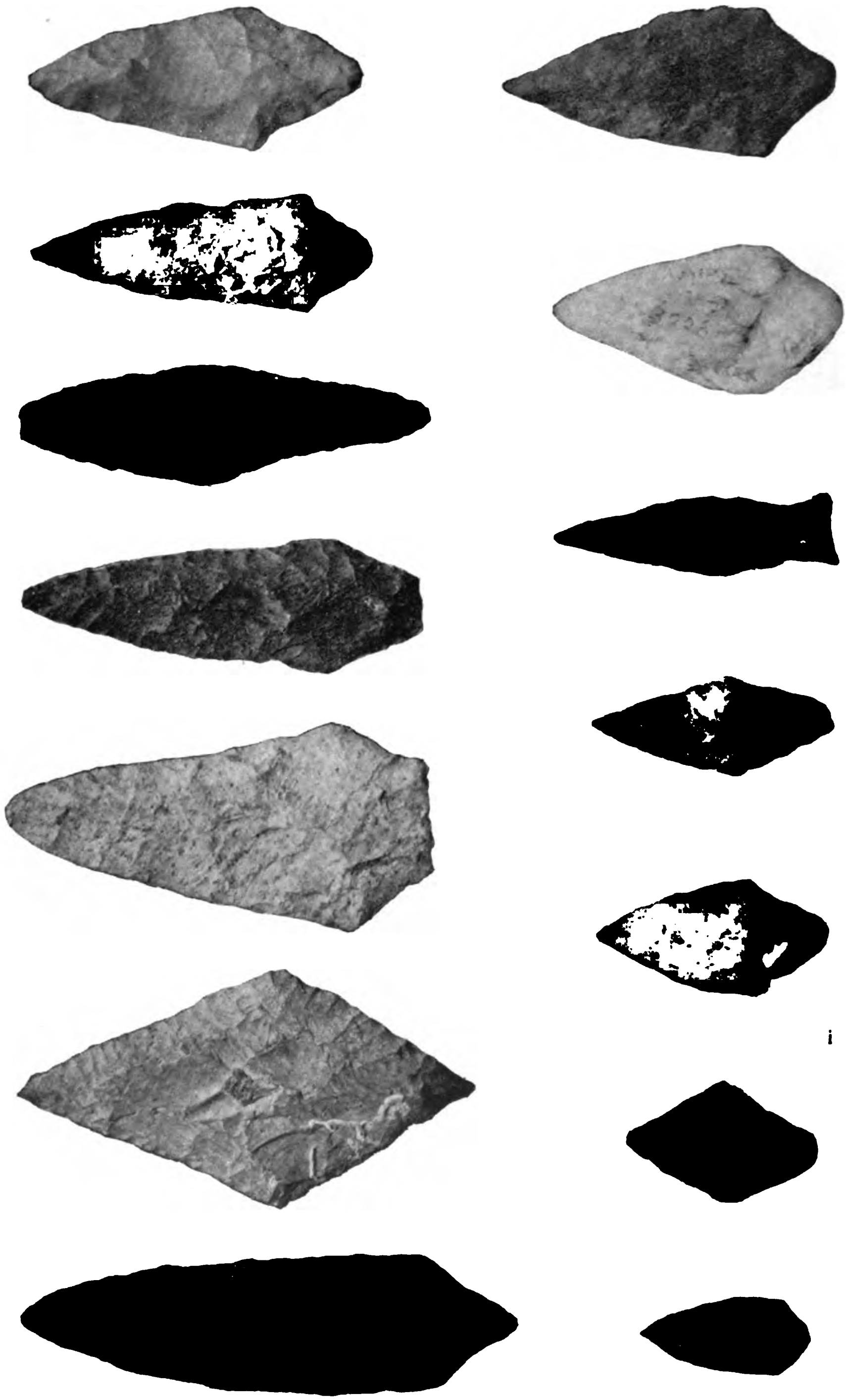
The author has not made this class dependent upon the lines of the edges or bases of these implements; they may be either convex, straight, or concave, and neither of these will have any effect as to which class the implement is to be assigned. He has considered that it made but slight difference to the primitive hunter or warrior when about to use one of these implements, either as an arrowpoint, spearhead, or as a knife, whether it should be convex, straight, or concave, provided the point was sharp and the cutting edge keen and smooth. If to be used for piercing, the desideratum was a sharp point, the shape of the edge had no effect and was of no interest, and if as a knife and the edges to be used saw fashion, back and forth, it made little difference whether that edge should be concave, straight, or convex. As all stemmed implements presuppose a handle or shaft which incloses the stem, it makes equally slight difference whether the base of that stem should be concave, straight, or convex; there-

fore the author has not allowed any of these distinctions to influence his classification.

That these different classes and the forms on which they depend should overlap and run into one another would seem inevitable, thus making it sometimes doubtful to which class the implement should belong, and even difficult to decide correctly. The classification which is proposed, and indeed any classification which can be made is, as before stated, rather for the convenience of the modern student than from any intention of the primitive maker or user of these implements. While there may have been workshops which turned out certain forms of implements more than others, and while certain forms are found in given localities in greater numbers than in others, yet does not think that this was always the result of a well-defined intention on the part of the maker. If an arrowpoint, intended to have a convex edge, should by an unlucky stroke or an unintentional break be spoilt for that shape, it could still be remodeled and the edge made straight instead of convex, or concave instead of straight. So, also, that which was intended as a barbed arrowpoint, if one of the barbs should be broken, the barb on the other side could also be chipped off and the implement be made shouldered, but not barbed; and so on in other instances.

The author has bethought of what he considers a good illustration of the differences in these implements. In the show window of a modern shoe store will be seen shoes of every imaginable shape, size, kind, and variety; no two pairs of them are alike, running the entire range from large to small, from coarse to fine, from high to low, from thick to thin, from costly to cheap; yet they are all shoes, and all intended for the same object of foot wear. The workmen may all make the same kind of shoes or make different kinds at different times, yet they surely are all shoemakers. So it was with the arrow makers and the arrowpoints which they made; the difference in the arrowpoints may have been produced partly by the fashion of the locality, by the taste and ability of the workmen, or by the possibilities of the material; what may have been intended for one kind of arrowpoint may, by reason of the refractory material, have been changed to another, and the same workmen in the same workshop may, without having seriously intended, and perhaps without giving a good reason in every case, have produced nearly every kind of arrowpoint.

If the author made a separate class for every change in detail, he would have an infinite number of classes with infinitesimal differences. He has preferred to ignore these, make his divisions broad and plain, and temporize with the overlapping forms.



STEMMED ARROWPOINTS, SPEARHEADS, OR KNIVES.
Class A.

EXPLANATION OF PLATE 33.

1	2	3	4	5	6	7
14	13	12	11	10	9	8

STEMMED ARROWPOINTS, SPEARHEADS, OR KNIVES.

Class A.

Fig. 1. QUARTZITE.
(Cat. No. 34247, U.S.N.M. Truro, Barnstable County, Massachusetts. A. R. Crittenden.)

Fig. 2. PORPHYRY.
(Cat. No. 61428, U.S.N.M. La Paz, Lower California. L. Belding.)

Fig. 3. QUARTZ PORPHYRY.
(Cat. No. 18100, U.S.N.M. Rhode Island (from a cache of 100 similar objects. J. H. Clark.)

Fig. 4. BLACK QUARTZ PORPHYRY.
(Cat. No. 32183, U.S.N.M. Keeseville, Essex County, New York. A. W. White.)

Fig. 5. MOTTLED BROWN OBSIDIAN.
(Cat. No. 21372, U.S.N.M. Hupa Indian Reservation. Stephen Bowers.)

Fig. 6. QUARTZITE.
(Cat. No. 6111, U.S.N.M. District of Columbia. Mrs. M. H. Schoolcraft.)

Fig. 7. CHALCEDONY.
(Cat. No. 34417, U.S.N.M. Plantersville, Morehouse County, Iowa. Dr. B. H. Brodnax.)

Fig. 8. ARGILLITE.
(Cat. No. 19371, U.S.N.M. Trenton, New Jersey. Dr. C. C. Abbott.)

Fig. 9. WHITE QUARTZ.
(Cat. No. 19008, U.S.N.M. Griffin, Spaulding County, Georgia. W. F. Bailey.)

Fig. 10. BROWN JASPER.
(Cat. No. 34861, U.S.N.M. Island in Susquehannah River. F. G. Gailbraith.)

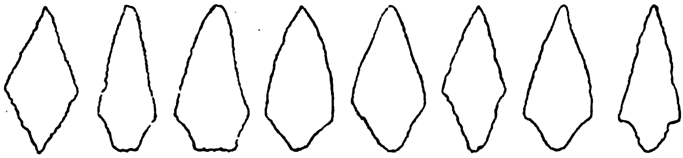
Fig. 11. OPALESCENT CHALCEDONY.
(Cat. No. 29683, U.S.N.M. San Miguel Island, California. Stephen Bowers.)

Fig. 12. WHITE QUARTZ.
(Cat. No. 6443, U.S.N.M. Farmingdale, Queens County, New York. J. C. Merritt.)

Fig. 13. QUARTZITE.
(Cat. No. 1275, U.S.N.M. Farmingdale, Queens County, New York. J. C. Merritt.)

Fig. 14. WHITE QUARTZ.
(Cat. No. 139271, U.S.N.M. District of Columbia. S. V. Proudfit.)

CLASS A.—LOZENGE-SHAPED. (Plate 33.)



These implements are usually small. They are the simplest in form and, for the most part, rudest in execution; yet this is no signification that they were the beginnings or that there was an evolution from this to the more elaborate forms. This simplicity and rudeness may be accounted for in divers ways. The refractory material may have had something to do with it, also the rapidity with which they were required to be made and the unskillfulness of the arrow maker. They may have been made during his apprenticeship; he, who in his beginning made these simplest and rudest implements may have so acquired the art as afterwards to make the finest and most delicate.

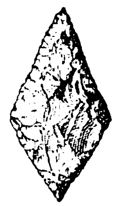


Fig. 139.

STEMMED ARROWPOINT OF PORPHYRITIC FELSITE, LOZENGE-SHAPED.

La Paz, Lower California.

Division III, Class A.

$4 \times 2\frac{1}{8} \times \frac{3}{8}$.

Cat. No. 61498, U.S.N.M.

These form Class A, the first of the division of stemmed arrowpoints. The existence of a stem implies its insertion in a shaft or handle; therefore there can be little or no doubt that these were intended to be thus used.

Fig. 140.

STEMMED ARROWPOINT OF PORPHYRITIC FELSITE, LOZENGE-SHAPED.

Edgartown, Dukes County, Massachusetts.

Division III, Class A.

$2\frac{3}{4} \times 1\frac{1}{8} \times \frac{3}{8}$.

Cat. No. 18103, U.S.N.M.

Fig. 139 is one of the largest, as it is one of the best in workmanship, of its class in the U. S. National Museum. It is of porphyritic material, and comes from Lower California, therefore it affords no standard of comparison; for the types of implements in that country are different from those in other parts of the United States. It is lozenge-shaped, is so regularly pointed at both ends that it is uncertain which end was point and which was base.

Fig. 141.

STEMMED ARROWPOINT OF WHITE QUARTZ, LOZENGE-SHAPED.

Division III, Class A.

$1\frac{11}{16} \times \frac{3}{4} \times \frac{5}{16}$.

Cat. No. 5897, U.S.N.M.

Fig. 140 comes from Massachusetts, is similar in form, with its sharp point and base, and, curiously enough, is also of porphyritic material. These sharp-pointed bases of the class are unusual, if not rare, in any part of the United States. The more usual form of lozenge shape is shown in fig. 141, which is of quartz, and comes from Charles County, Maryland. The refractory character of this material may account largely for the predominance of this simple form and rude style of arrowpoint. It is

inordinately thick compared with its width. It is three-fourths of an inch wide and five-sixteenths thick, nearly one-half. The leaf-shaped implements which have been described were five or six times greater in width than thickness.

Fig. 142.

STEMMED ARROW-POINT, LOZENGE-SHAPED.

East Windsor, Hartford County, Connecticut.

Division III, Class A.

$1\frac{3}{8}$ x $\frac{3}{4}$ x $\frac{1}{4}$.

Cat. No. 6084, U.S.N.M.

The lozenge-shaped arrowhead with a rude but pointed stem without shoulders would appear impossible to fasten firmly in an arrow shaft by means of ligatures, which suggests that some kind of gum or adhesive substance was used to make it fast, though the author does not know that any such specimen has been found showing traces of gum. Because of the great size and rudeness of the base of some of these implements, they may have been too large to receive the small arrow shaft and so may have required comparatively large and heavy handles. Thus, despite their small size as a class, they may have served as spears or possibly knives—who knows? This is purely conjecture, based upon the appearance of the implement itself, and is liable to be overturned by the discovery of any new fact concerning it.

Fig. 143.

STEMMED ARROW-POINT, LOZENGE-SHAPED.

Keeseville, Essex County, New York.

Division III, Class A.

$3\frac{1}{8}$ x $1\frac{5}{16}$ x $\frac{5}{16}$.

Cat. No. 32183, U.S.N.M.

Fig. 142, still lozenge-shaped, has no shoulder, but has a rudimentary base. The arrow maker has not, as in the former instance, worked the base to a point, but has left it one-fourth of an inch in width. This specimen is from Connecticut, is of the dark-gray flint common to that State, and is a fair sample of the average size of this class of arrowpoint.

Fig. 144.

STEMMED ARROW-POINT OF PALE GRAY FLINT, LOZENGE-SHAPED.

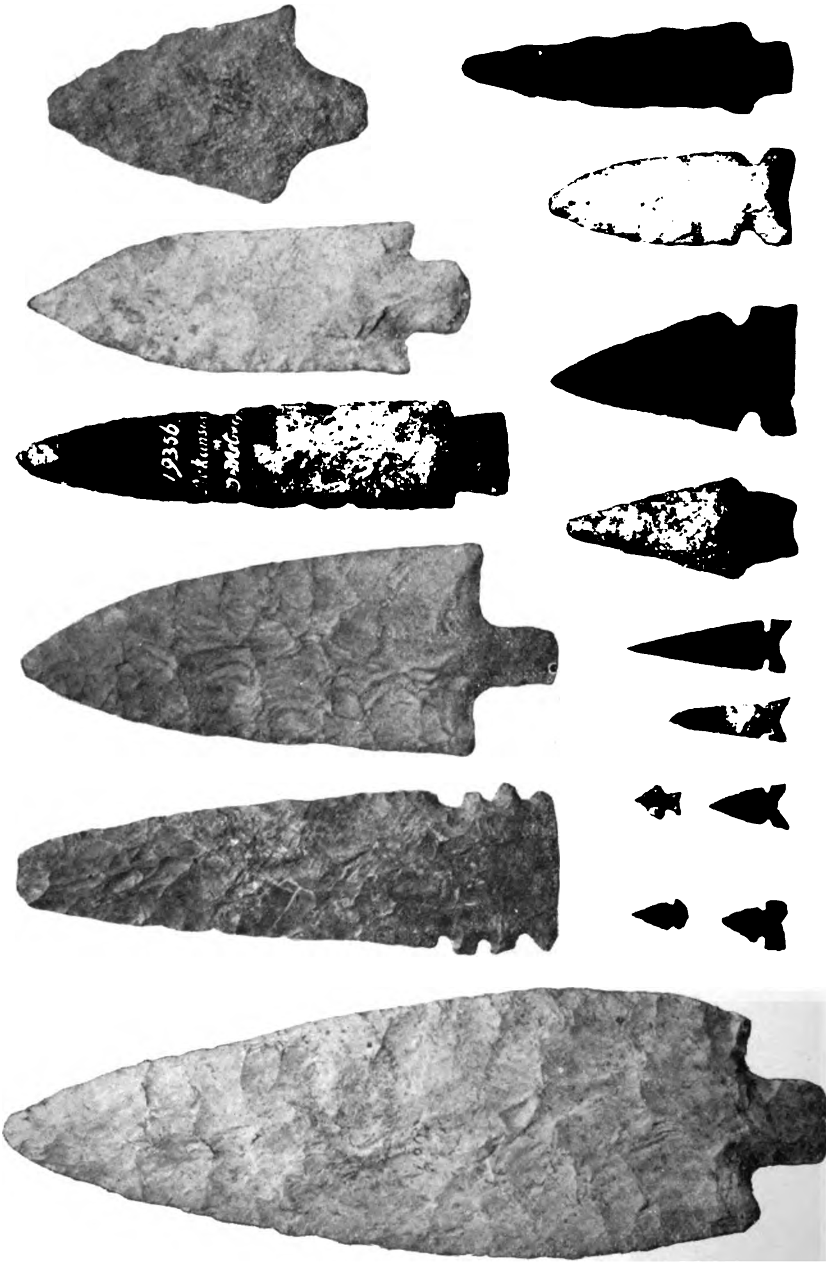
Division III, Class A.

$2\frac{1}{4}$ x 1 x $\frac{3}{8}$.

Cat. No. 57998, U.S.N.M.

Fig. 143 is of black flint from New York, of larger size than usual, but carries with it the simplicity of form and rudeness of manufacture mentioned of the others. The stem is still lozenge-shaped, no shoulder, and again the rudimentary base which here is about one-half an inch thick.

Fig. 144 is a specimen from Tennessee which merely repeats the peculiarities of the former specimens.



STEMMED ARROWPOINTS, SPEARHEADS, OR KNIVES.

Class B.

EXPLANATION OF PLATE 34.

1	2	3	4	5	6		
15	16						
14	13	12	11	10	9	8	7

STEMMED ARROWPOINTS, SPEARHEADS, OR KNIVES.

Class B.

Fig. 1. CHERT.
(Cat. No. 6802, U.S.N.M. Ohio. J. H. Devereux.)

Fig. 2. ROUGH IRONSTONE.
(Cat. No. 7007, U.S.N.M. Dennysville, Washington County, Maine. Benjamin Lincoln.)

Fig. 3. ARGILLITE.
(Cat. No. 18004, U.S.N.M. Connecticut. J. H. Clark.)

Fig. 4. DARK GRAY FLINT.
(Cat. No. 19356, U.S.N.M. Mineral Springs, Arkansas. Dr. E. W. McCreary.)

Fig. 5. WHITE CHERT.
(Cat. No. 99307*a*, U.S.N.M. Boone County, Missouri. G. W. Clements.)

Fig. 6. QUARTZITE.
(Cat. No. 748, U.S.N.M. District of Columbia. James Webster.)

Fig. 7. ARGILLITE.
(Cat. No. 137563, U.S.N.M. Trenton, New Jersey. Thomas Wilson.)

Fig. 8. WHITE FLINT.
(Cat. No. 59473, U.S.N.M. Hancock County, Illinois. M. Tandy.)

Fig. 9. PALE-BROWN TRANSLUCENT CHALCEDONY.
(Cat. No. 59002, U.S.N.M. Pueblo of Taos, New Mexico. Capt. M. Wheeler, U. S. Geological Survey.)

Fig. 10. QUARTZITE.
(Cat. No. 139253, U.S.N.M. District of Columbia. S. V. Proudfit.)

Fig. 11. BLACK OBSIDIAN.
(Cat. No. 34564, U.S.N.M. Stockton, San Joaquin County, California. L. Belding.)

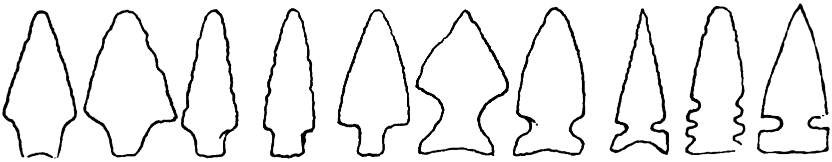
Fig. 12. PINK CHERT.
(Cat. No. 43032, U.S.N.M. Stockton, California. L. Belding.)

Fig. 13. GREENISH-BLACK FLINT.
(Cat. No. 42650, U.S.N.M. San Joaquin County, California. L. Belding.)

Figs. 14, 15. STRAW-COLORED FLINT.
(Cat. No. 136960*a*, *b*, U.S.N.M. Labette County, Kansas. W. S. Hill.)

Fig. 16. GRAY FLINT.
(Cat. No. 17493, U.S.N.M. Maysville, Mason County, Kentucky. J. W. Pearce.)

CLASS B.—SHOULDERED BUT NOT BARBED. (Plate 34.)



Implements of this class are more numerous than those of any other division. There is this pronounced difference between them and any others we have described. The implements have two parts with different functions: (1) the blade which comprises the point and edges, and is for piercing or cutting, and (2) the stem, for insertion in a shaft or handle.

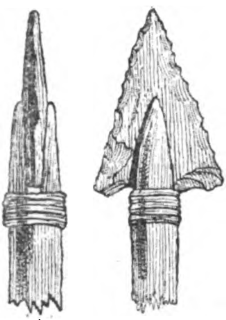


Fig. 145.

PREHISTORIC STONE ARROWPOINT INSERTED IN SHAFT AND TIED WITH FIBER.

Found in peat-moss of Giessboden, Switzerland.

Fig. 146.

STEMMED ARROWPOINT OF BLACK FLINT, SHOULDERED BUT NOT BARBED.

Plainfield, Windham County, Connecticut.

Division III, Class B.

$5\frac{3}{8} \times 2\frac{1}{4} \times \frac{3}{8}$.

Cat. No. 18884, U.S.N.M.

We can not imagine the use of the stem to an arrowpoint or spearhead which would not be intended for insertion in a shaft or handle. The leaf-shaped may or may not have been inserted in a handle; many of them we know were not. It was the opinion of Dr. Rau that in certain specimens the base had served as a chisel or scraper. But the stem had no other function than for insertion in a shaft or handle. This function was subject to great variations, and, as we shall see, there were many kinds of stems and great variability in the mode of attachment.

Fig. 145 is one of the few specimens of ancient arrowheads found attached to its shaft or handle. It comes from the peat moss of Giessboden, Switzerland, and is figured in Keller's Lake Dwellings.[1] The handle is broken so that it is uncertain whether the implement was arrow or knife, but the bast or fiber with which it was lashed is still discernible. Similar specimens have been found occasionally in Ireland and in Germany.

Figs. 146 and 147 are the simplest and most pronounced of Class B, stemmed and shouldered, but not barbed. The stem is straight, with parallel edges and straight base; the shoulders are square and at

[1] Volume II, Plate XXXIX, No. 15, from which it is reproduced in Evans's Ancient Stone Implements, p. 364, fig. 343.

right angles to the stem, and so give it almost a triangular appearance. The edges are convex and symmetrical, and the point on the median line. They are from 3 to 5 inches long, and inserted in a proper shaft would make a good spear or lance, which in the hands of a strong and active man would be a most effective weapon. Many of the implements, all those of Class C, seem to have been shouldered with the idea of making a barbed weapon, but the first intention was to make a stemmed weapon.

Fig. 147.
STEMMED ARROWPOINT OF GRAY FLINT, SHOULDERED BUT NOT BARBED.
Kingston, Washington County, Rhode Island.
Division III, Class B.
3⅞ x 2 x ½.
Cat. No. 18053, U.S.N.M.

Fig. 148.
STEMMED ARROWPOINT, SHOULDERED BUT NOT BARBED.
Groveport, Franklin County, Ohio.
Division III, Class B.
3⅛ x 2 x ½.
Cat. No. 7678, U.S.N.M.

Fig. 148 is impure flint bordering on chert or hornstone. The implement is rude and thick, the edges are rough and untrimmed, and the flakes have been large and coarse. Whatever of this may be charged against the material, it is certain that it might have been better finished with more time and greater skill, and, therefore, we must consider it as an incompleted specimen.

Fig. 149 is of hard gray slate. It is extremely rough in its chipping, although the outline may be good. Its stem is straight and parallel, the base concave, the shoulders, instead of being square, are at an upward angle, the corners project far beyond the edges so that they have the appearance of barbs projecting horizontally and not perpendicularly. They never could have been intended to serve as barbs and prevent the extraction of the weapon from the pierced flesh. The edges beyond the corners or barbs are nearly straight, but slightly convex at the point. The workmanship is so rude and the material so refractory that it is with difficulty one can discover the flakes by which it was worked.

Fig. 149.
STEMMED ARROWPOINT OF GREENISH-GRAY HARD SLATE, SHOULDERED BUT NOT BARBED.
Georgia.
Division III, Class B.
4⅛ x 2 x 7/16.
Cat. No. 19565, U.S.N.M.

Fig. 150.
STEMMED ARROWPOINT, SHOULDERED BUT NOT BARBED.
Southold, Suffolk County (Long Island), New York.
Division III, Class B.
2 x 1¼ x ½.
Cat. No. 21206, U.S.N.M.

Fig. 150 is of white quartz from Long Island, New York. The material is in abundance, wrought into oval scrapers, and found in the shell-heaps on the eastern end of Long Island. Its stem and base are

straight, the shoulders are slight and unsymmetrical, while the edges are straight and come to a point. The implement is exceedingly thick, the base being more than half as thick as it is wide. The workmanship is rude; one can scarcely see where any flakes have been struck off, and it would seem to have been broken to its present shape by blows given at random. We must remodel our ideas in regard to arrow shafts if we would have this implement inserted therein, whether to be fastened by ligatures or gum. It is probably unfinished.

Fig. 151.

STEMMED ARROWPOINT, SHOULDERED BUT NOT BARBED.

Tennessee.

Division III, Class B.

$2\frac{1}{8} \times 1 \times \frac{5}{16}$.

Cat. No. 8238, U.S.N.M.

Fig. 152.

STEMMED ARROWPOINT, SHOULDERED BUT NOT BARBED.

New Braunfels, Comal County, Texas.

Division III, Class B.

$1\frac{5}{8} \times \frac{7}{8} \times \frac{5}{16}$.

Cat. No. 21158, U.S.N.M.

Fig. 151 is somewhat the same form as those just described, but its workmanship is better. It has been fairly well chipped, the flakes taken off are easily recognizable, and the edges all around are fairly smooth and sharp. It is of reddish jasper. The stem is straight and parallel, the base is straight, the edges from the base to the blade are slightly concave, forming the shoulders; while those from the shoulder to the point are convex.

Fig. 152 is of whitish flint from Texas. It is rude in its manufacture, quite thick compared with the width, the stem is straight, the base slightly concave, the shoulders but little more than rudimentary, and altogether it serves to emphasize the difficulty of inserting these implements in a shaft in such manner as to serve as arrows.

Fig. 153.

STEMMED ARROWPOINT, SHOULDERED BUT NOT BARBED.

Plantersville, Morehouse County, Louisiana.

Division III, Class B.

$2\frac{3}{4} \times 1\frac{1}{4} \times \frac{3}{8}$.

Cat. No. 34407, U.S.N.M.

Fig. 154.

STEMMED ARROWPOINT OF PALE GRAY FLINT, SHOULDERED BUT NOT BARBED.

St. Mary County, Maryland.

Division III, Class B.

$3\frac{3}{4} \times 2\frac{1}{4} \times \frac{1}{4}$.

Cat. No. 12185, U.S.N.M.

Fig. 153 is of bluish chalcedony from Louisiana. It is much finer and better made, thinner compared with the width, and would be much easier inserted in an arrow shaft or handle. Its stem is tapering, the base straight, the shoulders indefinite, the edges convex and coming together form a point.

Fig. 154 has the edges of its blade straight and not convex. The point and corners are somewhat rounded; it is shouldered but not barbed, the stem is expanding, and the base is slightly concave. Its size, length, and width, compared with thickness, place it on the border between an arrowpoint and a spearhead.

Fig. 155 is similar to fig. 151, just described. Though widely separated by distance, the former coming from Tennessee, the latter from Pennsylvania, they have great resemblance. Both are of jasper, with apparently the same style of workmanship. The base, stem, and shoulders of the latter are much the same as the former, except that they are accentuated. The stem is narrower, its lines more concave or slightly more expanding toward the base, where they form corners of an acute angle. The base is slightly concave where the other is straight. The implement is the same length as fig. 151, though narrower and thinner.

Fig. 155.

STEMMED ARROW-POINT OF YELLOWISH-BROWN JASPER, SHOULDERED BUT NOT BARBED.

Susquehanna River, Pennsylvania.

Division III, Class B.

2⅛ x ¾ x ¼.

Cat. No. 34861, U.S.N.M.

Fig. 156 is from Ohio. It, like the former specimen, is fairly well chipped, flakes plainly to be seen, and the edges and point comparatively smooth and sharp. The stem is straight, its edges parallel, and the base straight and square. The shoulders are formed after the same manner as fig. 151, preceding, and simply swell out so as to make a more pronounced shoulder than in that specimen. The edges are convex and coming together form the point.

Fig. 156.

STEMMED ARROW-POINT OF YELLOWISH-GRAY FLINT, SHOULDERED BUT NOT BARBED.

Brownsville, Licking County, Ohio.

Division III, Class B.

1¾ x 1 x ⅜.

Cat. No. 19487, U.S.N.M.

Figs. 157 and 158, the former from Tennessee, the latter from Massachusetts, are almost identical in form. The former is of gray, the latter of black flint. With exceptions of material, color, and size, they are the same. If they were to be compared by form only, scarcely anyone would be able to detect a difference between them. Their edges are straight and come directly to a point. Their shoulders are horizonal, not barbed; the notch which forms the stem is concave and carried to the base of the stem; the base is square and dressed to a smooth edge so that it can be inserted in a split arrow shaft, while the notches on either side afford excellent supports for attachment by ligatures.

Fig. 157.

STEMMED ARROW-POINT, SHOULDERED BUT NOT BARBED.

Lincoln County, Tennessee.

Division III, Class B.

2⅛ x 1 x ¼.

Cat. No. 61128, U.S.N.M.

Fig. 158.

STEMMED ARROW-POINT, SHOULDERED BUT NOT BARBED.

South Dennis, Barnstable County, Massachusetts.

Division III, Class B.

1⅝ x ⅝ x ¼.

Cat. No. 18056, U.S.N.M.

Fig. 159 has a stem similar to figs. 157 and 158. The notch which forms it is concave, extending from shoulder to base and making an expanding stem with convex base. The edges are convex and, converging symmetrically, form a medium sharp point.

The next two specimens (figs. 160, 161), while having stems shouldered and not barbed, belong to Class B, but represent a marked difference from the former specimens. While the edges of the stem are straight and parallel, the base is convex. No reason has ever been given for this peculiarity, but it is a noticeable one and involves another even less explainable. Why the stem of an arrowpoint intended for insertion in a shaft should be made convex instead of straight or concave, is a matter of but slight importance and need in itself excite no curiosity; but all bases of stems which are convex have been worn or rubbed, or in some way made smooth. They have not been polished or ground upon the sides, but have been operated in a reverse manner against the edge of the base, and have made it blunt and smooth and not sharp. It would be beyond the author's province to say that this is universal, for no man could have had sufficient experience to justify such a statement, but in the U. S. National Museum thousands of such arrowpoints have been tested and 90 per cent or more of them have been found to be in this condition. No explanation has ever been given, nor has any been suggested. It is more marked in the cases of leaf-shaped implements which have been transformed into stemmed arrowpoints, leaving the convexity of the base unchanged. The points and edges seem to have had no share in the operation and they continue rough and sharp. Fig. 160 is of yellowish jasper, comes from Lincoln County, Mississippi, and is doubtless from the same jasper quarry which furnished the great number of jasper beads found there in a workshop by Mr. Keenan and described by him.[1] Fig. 161 is the same form as the preceding. It is of white flint from Illinois, and is much finer and more delicate than the jasper one, but it has the convex base, the smoothed condition of which is quite perceptible.

Fig. 159.
STEMMED ARROWPOINT OF BLUISH CHALCEDONIC FLINT, SHOULDERED BUT NOT BARBED.
Ohio.
Division III, Class B.
$2\frac{1}{4} \times 1\frac{1}{4} \times \frac{5}{16}$.
Cat. No. 16482, U.S.N.M.

Fig. 160.
STEMMED ARROWPOINT, SHOULDERED BUT NOT BARBED.
Division III, Class B.
$2\frac{5}{8} \times 1 \times \frac{3}{8}$.
Cat. No. 9789, U.S.N.M.

Fig. 161.
STEMMED ARROWPOINT, SHOULDERED BUT NOT BARBED.
St. Clair County, Illinois.
Division III, Class B.
$1\frac{3}{8} \times \frac{7}{8} \times \frac{1}{4}$.
Cat. No. 15323, U.S.N.M.

Fig. 162.
STEMMED ARROWPOINT OF GRAY FLINT, SHOULDERED BUT NOT BARBED.
Edmondson County, Kentucky.
Division III, Class B.
$3 \times 1\frac{3}{8} \times \frac{3}{8}$.
Cat. No. 59347, U.S.N.M.

The next three figures (162–164) represent another form of base. The

[1] Smithsonian Report, 1877, p. 291.

edges and points are the same as in other specimens. They are shouldered, but not barbed, and the stem at its base is the same as other stems; but instead of its edges being parallel and making a straight or square stem, they are convex and bring the base of the stem to a point. Fig. 162 is a good representative of this type. It is symmetrical; the chipping is not fine, but fairly well done; the base and shoulders are square, the stem contracting by convex edges, and the base pointed. Fig. 163 is from Tennessee, while the former is from Kentucky; but the material of both is the same quality of gray flint, and as the two States are contiguous, we may easily suppose that the American Indian who made these implements was not governed by State lines, and both points may have come from the same quarry. The base is pointed, made so by convex edges. Fig. 164 has the same contracted stem, but its edges are straight and not convex and its base is pointed. It comes from a locality far distant from the others, namely, California, showing that these forms were not confined to a given locality. It is well chipped, symmetrically formed, but has the projecting horizontal barb, as was described in fig. 149. It is long and slender, and could have penetrated the flesh of the game or enemy a distance of $2\frac{1}{2}$ inches without interference from these horizontal projections.

Fig. 163.

STEMMED ARROW-POINT, SHOULDERED BUT NOT BARBED.

Division III. Class B.

$2\frac{7}{8} \times 1 \times \frac{1}{4}$.

Cat. No. 8914, U.S.N.M.

Fig 164.

STEMMED ARROW-POINT OF BLACK FLINT, SHOULDERED BUT NOT BARBED.

San Miguel Island, California.

Division III, Class B.

$2\frac{1}{8} \times 1 \times \frac{5}{16}$.

Cat. No. 15748, U.S.N.M.

The type of which the author is now to speak has given him more trouble in its classification than any other, and yet he has concluded to classify it as a stemmed arrowpoint, shouldered but not barbed, and has put it in Class B. The blades may be thick or thin, wide or narrow, edges concave, straight, or convex, points sharp or blunt, and so through all the variations. The stem is formed by notches made in the edges near the lower end which, with the notch, forms the base of the arrowpoint.

Fig. 165.

STEMMED ARROW-POINT, SHOULDERED BUT NOT BARBED.

Ohio.

Division III, Class B.

$2\frac{1}{8} \times 1 \times \frac{1}{4}$.

Cat. No. 16451, U.S.N.M.

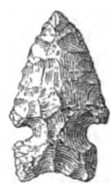


Fig. 166.

STEMMED ARROW-POINT OF DARK GRAY FLINT, SHOULDERED BUT NOT BARBED.

Tennessee.

Division III, Class B.

$1\frac{3}{4} \times 1 \times \frac{1}{4}$.

Cat. No. 8238a, U.S.N.M.

Fig. 165 is a representative of the type. It is of black flint; its edges are convex, drawing gradually to a point; the base is straight and

as wide as the broadest part of the blade. Its base is formed by two notches made in each edge opposite each other and forming, so far as concerns the edges, a groove around the implement which may have been utilized for fastening the arrow shaft by a ligature. These notches are about one-fourth of an inch wide and as much deep, and are distant from the base about one-fourth of an inch, so that they have been denominated in some other classification as "notched on the edge near the base." This notching has left the base its original width and unchanged, as though the notches had not been made nor the implement transformed from a leaf-shaped or possibly triangular arrowpoint into a stemmed one.

Fig. 167.

STEMMED ARROWPOINT, SHOULDERED BUT NOT BARBED.

Division III, Class B.

$1\frac{3}{8} \times 1 \times \frac{3}{16}$.

Cat. No. 8336, U.S.N.M.

Fig. 166 is much smaller than the former, but size does not seem to have affected this type of arrowpoint more than it has the others. The implement is symmetrical, edges are convex, and the outline can be traced past the notches to the base, and, but for the notches, it would have been a leaf-shaped implement of Class B, pointed at one end and concave at the base. The notches are about one-fourth of an inch wide and deep, and the distance from the base is about three-eighths of an inch. We will see in the next class how, evidently, some of these stemmed arrowpoints were made from leaf-shaped implements, by the introduction of these notches. In the present case the notches are horizontal and form shoulders but not barbs. In the next class (C) they will be at an upward angle toward the center, their shoulders form barbs, and they pass into that class and are not further noticed in this.

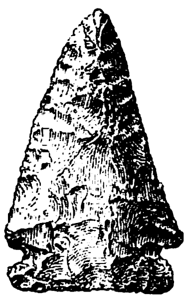


Fig. 168.

STEMMED ARROWPOINT OF WHITE JASPERY FLINT, SHOULDERED BUT NOT BARBED.

West Bend, Washington County, Wisconsin.

Division III, Class B.

$3 \times 1\frac{3}{4} \times \frac{3}{8}$.

Cat. No. 32169, U.S.N.M.

Fig. 167 is of gray flint from Ohio. It is rather small and has the same horizontal notches, smaller than those noticed before, but the outline of the leaf-shaped implement is more apparent in it than in the others. That it was originally a leaf-shaped implement, transformed by the notches into a stemmed and shouldered arrowpoint, is satisfactorily shown from an inspection of the implement. It has the convex base which was referred to and described under fig. 160 as polished or rubbed smooth on its edge. This peculiarity is wonderfully well represented in the specimen now under consideration. The edge of the base is blunt and smooth, while the edges and point of the blade are rough and sharp as any ever were. There are some peculiarities appertaining to the implements and objects of prehistoric man which, by reason of their repetition, have become accepted facts, the explanation of which has as yet defied all theories of the most inventive imagination. This is one.

Fig. 168, instead of being leaf-shaped as have been some of the foregoing, was a triangular arrowpoint. Its edges are straight, and, approaching each other, form the point at an acute angle. The base is straight and square, but one-fourth of an inch above it toward the point are two notches, one on each side, about one-fourth of an inch each way, which transform it from a triangular into a stemmed arrowpoint.

Fig. 169.

STEMMED ARROWPOINT OF BROWN FLINT, SHOULDERED BUT NOT BARBED.

Dennysville, Washington County, Maine.

Division III, Class B.

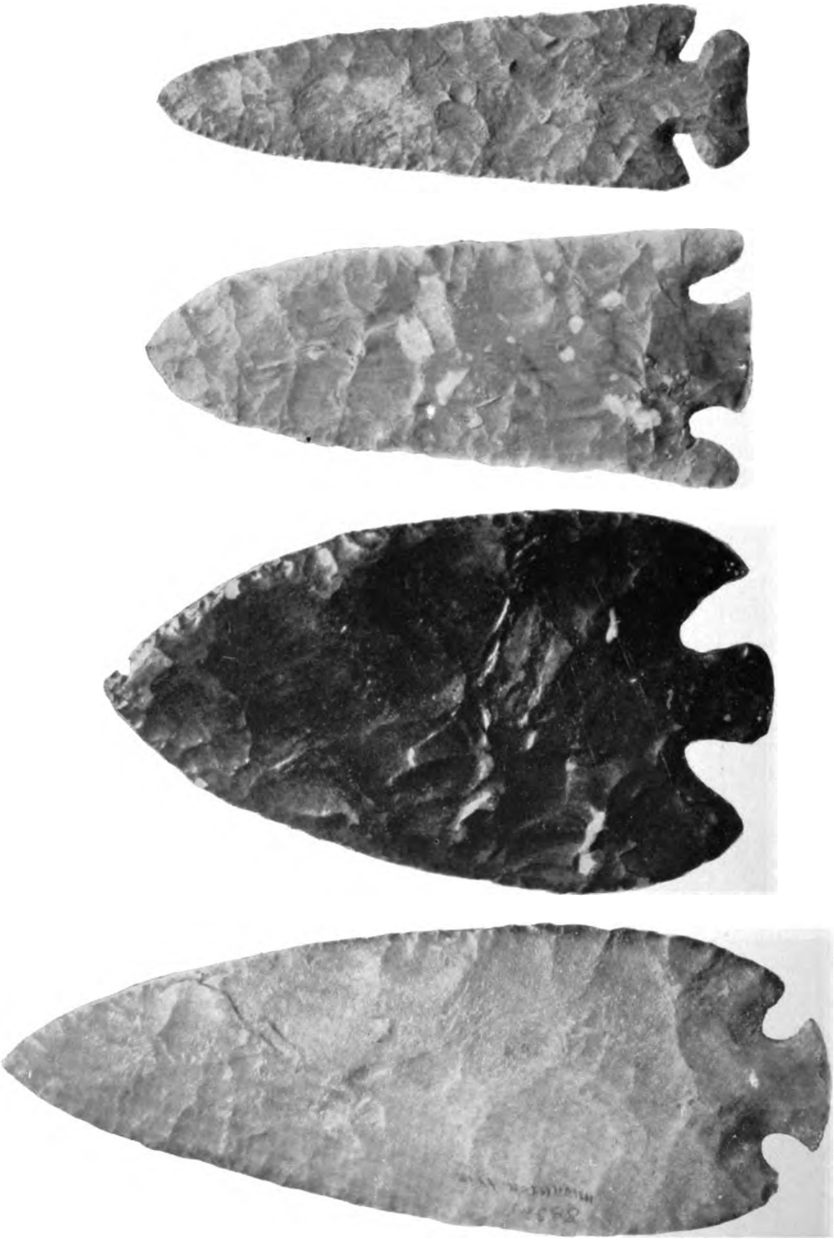
$6\frac{1}{4} \times 1\frac{3}{4} \times \frac{7}{16}$.

Cat. No. 7007, U.S.N.M.

Fig. 169, while belonging to the same class, has the peculiarity of three notches on the edges instead of one, as in all former illustrations. It is much larger than any of the others, its edges are straight, or nearly so, and, but for the notches which transform it into a stemmed implement, it would be nearly a triangular one. The base is straight and at right angles with the median line, the notches are about one-fourth of an inch each way and separated from each other about one-fourth of an inch. It would appear as though they might have been employed for three ligatures, or for ligature in three places, the farthest of which would be about $1\frac{1}{8}$ inches from the base, thereby giving the handle that much more firmness and solidity in its attachment.

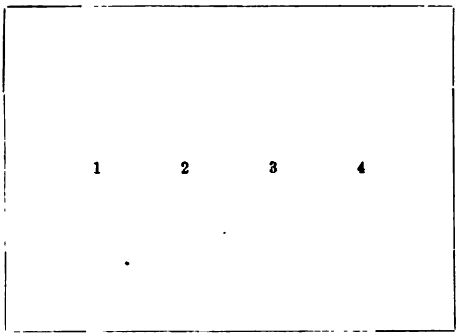
A type of arrowpoint belonging to this class has been found and identified by Dr. Abbott, with such peculiarities as demanded at his hands a separate and extended notice, which he gave in Primitive Industry.[1] An illustration of this implement is shown in Plate 34, fig. 7. Dr. Abbott believes in the existence in America, and especially on the Delaware River (the valley of the Delaware), of a Paleolithic civilization which, of course, antedated that of the Neolithic or American Indian civilization. All, or nearly all, the Paleolithic implements found in the glacial gravel of the Delaware River at Trenton, New Jersey, have been of argillite. It is his belief that this material was used principally by Paleolithic man. The specimens under consideration are of argillite and much weathered, showing a high antiquity. They are now a light gray color, but originally and on the inside are coal-black. The stone of which they are made is hard, and they could be chipped to a sharp point and edge. Their chipping has been rude and the flakes comparatively large. They are long and narrow, their edges nearly straight, approaching until they form a point. The shoulders were nearly square, not barbed, the stem short, edges parallel, and base straight and square. Altogether it is rude and unattractive, but in its original condition of sharp point and

[1] See also Popular Science Monthly, XXII, 1883, p. 315.



STEMMED ARROWPOINTS, SPEARHEADS, OR KNIVES.
Class C.

EXPLANATION OF PLATE 35.



STEMMED ARROWPOINTS, SPEARHEADS, OR KNIVES.

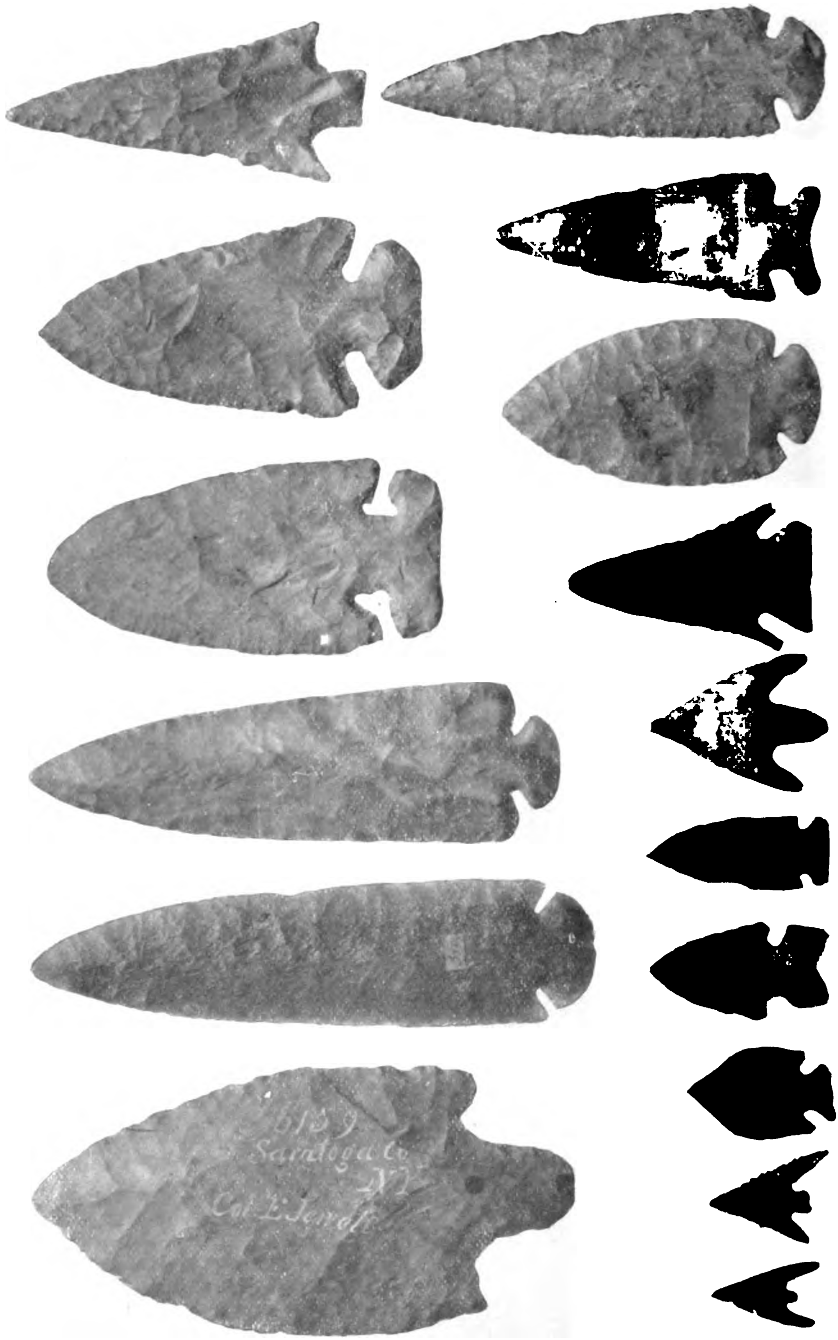
Class C.

Fig. 1. FINE-GRAINED QUARTZITE.
(Cat. No. 88339, U.S.N.M. De Soto, Vernon County, Wisconsin. J. D. Middleton.)

Fig. 2. DARK-BROWN CHALCEDONY (cast).
(Cat. No. 98340, U.S.N.M. Warners Landing, Vernon County, Wisconsin. J. L. De Witt.)

Fig. 3. BLUE-GRAY TRANSLUCENT CHALCEDONY.
(Cat. No. 148034, U.S.N.M. Mound, Putnam County, Ohio. J. R. Nisley.)

Fig. 4. BROWN FLINT.
(Cat. No. 173745, U.S.N.M. Williamson County, Illinois. H. C. Duvall.)



STEMMED ARROWPOINTS, SPEARHEADS, OR KNIVES.
Class C.

EXPLANATION OF PLATE 36.

	1		2	3		4	5		6
16	15	14	13	12	11	10	9	8	7

STEMMED ARROWPOINTS, SPEARHEADS, OR KNIVES.

Class C.

Fig. 1. LEAD-COLORED FLINT.
(Cat. No. 6159, U.S.N.M. Saratoga County, New York. Col. E. Jewett.)

Fig. 2. ROSE-TINTED QUARTZITE.
(Cat. No. 137927, U.S.N.M. Washington County, Missouri. Dr. Charles Rau.)

Fig. 3. VARIEGATED PINK AND SLATE-COLORED FLINT.
(Cat. No. 7659, U.S.N.M. Groveport, Ohio. W. R. Limpert.)

Fig. 4. GRAY FLINT OR CHERT.
(Cat. No. 172831, U.S.N.M. Ohio. W. K. Moorehead.)

Fig. 5. BLUE-GRAY CHALCEDONIC FLINT.
(Cat. No. 7108, U.S.N.M. Mount Carmel, Illinois. Mr. Ridgway.)

Fig. 6. PYROMACHIC FLINT.
(Cat. No. 31954, U.S.N.M. Montgomery County, Texas. Dr. J. L. Irish.)

Fig. 7. GRAY FLINT.
(Cat. No. 34581, U.S.N.M. McMinnville, Tennessee. W. W. Phillips and Dr. F. M. Brewer.)

Fig. 8. GRAY FLINT.
(Cat. No. 8239, U.S.N.M. Tennessee. J. H. Devereux.)

Fig. 9. YELLOWISH GRAY CHALCEDONIC FLINT.
(Cat. No. 10820, U.S.N.M. Milnersville, Ohio. D. Thompson.)

Fig. 10. BLUE-GRAY CHALCEDONIC FLINT.
(Cat. No. 18084, U.S.N.M. Paint Lick, Kentucky. J. B. Clark.)

Fig. 11. OPALESCENT CHALCEDONIC FLINT.
(Cat. No. 15231, U.S.N.M. Santa Barbara County, California. Paul Schumacher.)

Fig. 12. DRAB FLINT.
(Cat. No. 32440, U.S.N.M. Orange County, Indiana. F. M. Symmes.)

Fig. 13. BROWN FLINT.
(Cat. No. 8239*a*, U.S.N.M. Tennessee. J. H. Devereux.)

Fig. 14. BLACK FLINT.
(Cat. No. 34583, U.S.N.M. Sharpsburg, Maryland. A. P. Smith.)

Fig. 15. BLUE-GRAY CHALCEDONIC FLINT.
(Cat. No. 12681, U.S.N.M. Oregon. Paul Schumacher.)

Fig. 16. GREEN JASPERY FLINT.
(Cat. No. 12682, U.S.N.M. Oregon. Paul Schumacher.)

edges it might have been a very effective weapon. Dr. Abbott asserts that the large proportion of these implements are found in the alluvial soil in proximity to the glacial gravel at a depth that proves their antiquity. Their number increases in proportion to the depth of the excavation for a certain distance, when they stop, while the Paleolithic implements proper continue to a greater depth. Dr. Abbott believes these implements to have been used as harpoons for the capturing of fish, and he cites, as evidence supporting his theory, the fact that they are nearly all found along the borders of the streams. He remarks the great similarity of these implements with those used for a similar purpose by the Eskimos, and cites corresponding implements and figures described by Sir John Lubbock.[1] He propounds the theory whether the Eskimos may not have been driven down by the glaciers and occupied the territory of New Jersey, New York, Connecticut, etc., or whether driven down or not, they may not, with their present love of cold or for other reasons unknown, have dwelt near the foot of the glacier in these States and followed it up in its retreat north, until they came to occupy the present boreal region. It would seem to be indisputable that the territory around the feet of these glaciers was occupied by man, if it had not been prior to their descent. The implements found in the Trenton gravels would seem to show this. If this be accepted, the question may be fairly asked, What became of this people; who are their descendants; and, after the retreat of the glacier and the exposure of the country north, what course of departure, extension, or migration did their descendants take? These theories are not yet demonstrated and may never be, but they are worthy of profound investigation and study.

CLASS C.—SHOULDERED AND BARBED. (Plates 35, 36.)

The prehistoric man did not, in his manufacture of these implements, divide them into classes. The different forms were made according to the possibilities of the material, the dexterity of the workman, and the exigencies of the situation. The classification is now made solely for the purpose of enabling us in modern times to describe and understand them. Class C comprises those which have stems, shoulders, and barbs. The difference between the present class, C, and the preceding, B, is that the shoulders in the former were horizontal, at a right angle or more than a right angle to the median line

[1] Prehistoric Times, p. 503, fig. 218.

from the base upward. In the present class the point forming the shoulder is brought downward toward the base, so that it forms less than a right angle to the median line; this has the effect of making the shoulder an acute angle, and this angle forms the barb. The implements of this class, taken in their entirety, may be of different forms; sometimes they may be leaf-shaped, sometimes triangular; they may have either convex, straight, or concave edges; the point may be sharp or blunt; the base may be concave, straight, or convex. All these may exist in this subdivision, provided they are stemmed, shouldered, and barbed. No argument is necessary to justify a class which includes so many forms as those just mentioned. If a separate division should be given to each of these different forms when accompanied by barbs, the same should be done when without barbs. This would create so many divisions as to become unrecognizable and practically useless. This classification is based on the salient points of difference.

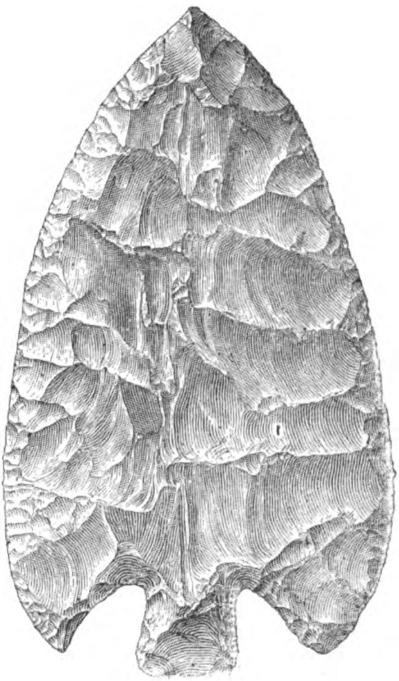


Fig. 170.
STEMMED SPEARHEAD, SHOULDERED AND BARBED.
Division III, Class C.
7 x 4 x $\frac{5}{16}$.
Cast, Cat. No. 98340, U.S.N.M. (Original in possession of Dr. J. L. DeWitt.)

The first illustration (fig. 170) presents a type of barbs by which they can be known and recognized throughout the description. It is a magnificent implement, translucent dark-brown chalcedony, and was found in a mound in Vernon County, Wisconsin. The figure is from a cast in the U. S. National Museum. The blade shows it to have been practically a leaf-shaped implement of Class B, one end pointed and the other convex. Whether it was originally thus, and afterwards transformed into a stemmed one, is unimportant and only a matter for conjecture. The notches have been made near the base, are V-shaped, and necessarily deep and wide; they form the edges of the stem nearly parallel and make it straight, neither expanding nor contracting. The V-shaped notch causes the shoulder to descend so that its junction with the outer edge forms an acute angle, and this acute angle forms the barb of the implement. The benefit of the barb in an arrowpoint or spearhead is that, having entered the flesh of the game or enemy, the barb prevents its withdrawal, as with the barb of the fishhook.

That this form was somewhat a matter of taste, and not always for the utilitarian purpose mentioned, is apparent upon a glance at this illustration and the two following. In these three specimens the size of the implement is so great and, compared therewith, the barbs so small that they are insignificant in actual utility. The thrusting of either one of these large specimens into any known game or enemy would be sufficient to kill the animal independent of the use of the barbs or the withdrawal of the weapon. It goes without saying that these, and possibly one other in this class, were too large for any possible use as arrows, and perhaps as knives, and if they had any utilitarian purpose it could only have been as a spearhead. It is a matter for conjecture and investigation whether they might not have served for ceremonial purposes, or as some insignia of authority or command, as the staff of a marshal, the scepter of a monarch, or the mace in the House of Representatives of Congress.

Fig. 171.

STEMMED SPEARHEAD OF WHITISH CHALCEDONY, SHOULDERED AND BARBED.

Shreveport, Caddo County, Louisiana.

Division III, Class C.

9¼ x 3⅛ x ¾.

Cat. No. 10095, U.S.N.M.

Fig. 171 is one of these remarkable implements. It is white or whitish translucent chalcedony, impure to be sure, but still fine enough with its extraordinary size to make it a magnificent implement. But for the barbs it would be assigned to the leaf-shaped Class B. Its edges are symmetrically convex and, converging, form the point. The notches forming the barbs have been made perpendicularly upward from the base, and not, as usual, horizontally from the edge. The notches are half an inch wide and three fourths of an inch deep; they leave the barbs to be three-fourths of an inch long, descending perpendicularly almost even with the base. The base is straight and square; the stem has parallel edges, is straight and not pointed. The whitish chalcedony, the material of this specimen, is not rare in the locality in which this was found (Shreveport, Louisiana), although the mine or quarry from which the material comes has, it is believed, never yet been found. The author is the owner of

fourteen such implements of the same material and the same general type, found in a cache in Pike County, Arkansas (see Plate 61). They were laid side by side, the edges overlapping and buried on the side of

Fig. 172.

STEMMED SPEARHEAD, SHOULDERED AND BARBED.

Crawford County, Wisconsin.

Division III, Class C.

10½ x 4½ x ½.

Cast, Cat. No. 39016, U.S.N.M.

the hill in the solid yellow clay. The erosion by rains and wash brought the surface down to them, and they were found slightly protruding.

Fig. 172 is an enormous implement of the same class. The U. S.

National Museum possesses only a cast of it, the original being in the possession of Mr. F. J. Miller, Prairie du Chien, Wisconsin. It is of brown jasper, and has been made from an immense flake of that material which has been struck off with a perceptible twist, as shown by the edge view accompanying. It is also rudely leaf-shaped, pointed at one end, the base nearly straight and square, the notches forming the barbs being oval or shell-like and made in the edges, not disturbing the base, although coming within a quarter of an inch of it.

Fig. 173.

STEMMED SPEARHEAD OF GRAY FLINT, SHOULDERED AND BARBED.

Saratoga County, New York.

Division III, Class C.

$5\frac{3}{8}$ x $2\frac{5}{8}$ x $\frac{9}{16}$.

Cat. No. 6159, U.S.N.M.

Fig. 174.

STEMMED SPEARHEAD OF GRAY FLINT, SHOULDERED AND BARBED.

McMinnville, Warren County, Tennessee.

Division III, Class C.

$4\frac{3}{8}$ x $1\frac{1}{4}$ x $\frac{3}{8}$.

Cat. No. 34581, U.S.N.M.

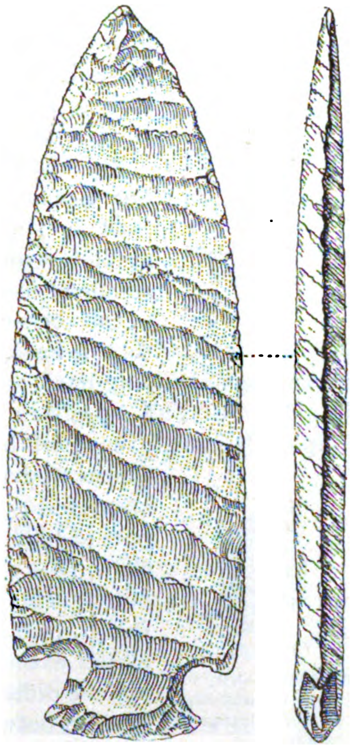


Fig. 175.

STEMMED SPEARHEAD, SHOULDERED AND BARBED.

Division III, Class C.

$3\frac{3}{4}$ x $1\frac{1}{4}$ x $\frac{1}{4}$.

Cat. No. 43134, U.S.N.M.

Fig. 173, though large even for a spearhead, does not compare in size with the enormous specimen just described. It is $5\frac{3}{8}$ inches long, has somewhat the appearance of a leaf-shaped implement, although there is no evidence of its transformation. It is of flint and has been made from a nodule, the concentric bands of which are to be seen, the point of the base coming almost to the surface of the nodule. The edges are convex, the stem is slightly contracting, and the base is convex. The barbs are well pronounced and form an acute angle; they have no relation to the stem, but are attached to and form a part of the blade.

The blade is twisted from the right side at the base to the left side at

the point. The twist is about equal to the thickness of the implement, and arises, not from the natural shape of the flake, but by chipping the edges all from one side. Whether this twist would give the missile a rotary motion as it was discharged from the bow, is a question examined in the division of peculiar forms, Class A, beveled edges, p. 931.

Fig. 176.
STEMMED ARROW-POINT OF GRAY FLINT, SHOULDERED AND BARBED.
Orange County, Indiana.
Division III, Class C.
$1\frac{7}{8} \times \frac{3}{4} \times \frac{3}{16}$.
Cat. No. 32440, U.S.N.M.

Fig. 174 appears to have been one of the leaf-shaped implements of Class B. It has a long, fine point, edges convex, base the same, with narrow notches in the edge near the base. The edge of the convex base has been ground down or worn smooth as described in figs. 160 and 161 of Class B, stemmed, Division III, p. 921.

Fig. 177.
STEMMED ARROW-POINT OF PALE BROWN FLINT, SHOULDERED AND BARBED.
Santa Barbara County, California.
Division III, Class C.
$1\frac{1}{4} \times 1\frac{3}{8} \times \frac{1}{4}$.
Cat. No. 15281, U.S.N.M.

Fig. 175 has convex edges converging symmetrically to the point, the base is slightly convex, while the notches which have made it into a stemmed and barbed implement are at the corners formed by the junction of the edges with the base. The V-shaped notches make the expanding base, and change the shoulders into barbs. This specimen is from a mound near Naples, Illinois, excavated by Mr. J. G. Henderson. The mound and the associated objects are described in the Smithsonian Report of 1882, where this is fig. 13 *a* (p. 696). The material is translucent pale brown chalcedony. This is the finest specimen of flint chipping in the U. S. National Museum. There may have been others exceedingly fine and highly interesting, and it may be difficult to draw lines of comparison between the various degrees of fineness, but the author has never seen anything showing a higher degree of mechanical art and manual dexterity in flint chipping.

Fig. 178.
STEMMED ARROW-POINT OF DARK GRAY FLINT, SHOULDERED AND BARBED.
Sharpsburg, Washington County, Maryland.
Division III, Class C.
$1\frac{1}{8} \times \frac{7}{8} \times \frac{3}{16}$.
Cat. No. 34553, U.S.N.M.

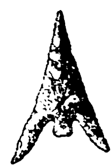
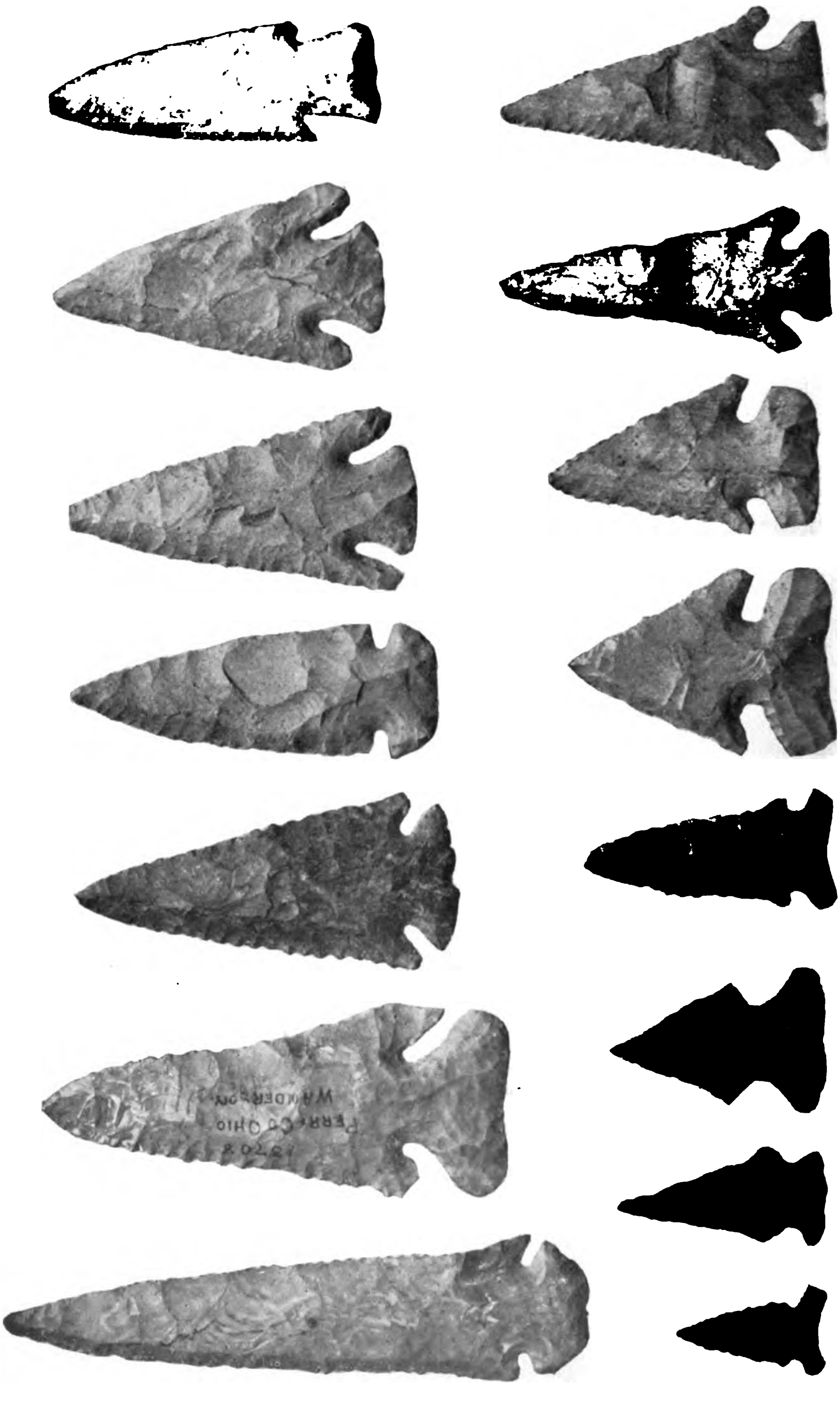


Fig. 179.
STEMMED ARROW-POINT, SHOULDERED AND BARBED.
Oregon.
Division III, Class C.
$1\frac{5}{8} \times 1 \times \frac{1}{8}$.
Cat. No. 12680, U.S.N.M.

Fig. 176, though reduced in size, is of sufficient weight to give momentum to the arrow, and will probably secure greatest flight. Its edges are symmetrically convex and, converging, form the point. The base is slightly convex, while the notches which form the barbs are in the edge near the base.

Fig. 177 has edges slightly convex, which come together at the point with a wide angle, making the implement of considerable breadth in proportion to its length. The stem is contracting and the base



PECULIAR FORMS OF ARROWPOINTS, SPEARHEADS, OR KNIVES.
Class A.

EXPLANATION OF PLATE 37.

1	2	3	4	5	6	7	
15	14	13	12	11	10	9	8

PECULIAR FORMS OF ARROWPOINTS, SPEARHEADS, OR KNIVES.

Class A.

Fig. 1. LIGHT-BROWN FLINT.
(Cat. No. 18800, U.S.N.M. Elkton, Giles County, Tennessee. J. R. Irby.)

Fig. 2. BLUE-GRAY FLINT.
(Cat. No. 13708, U.S.N.M. Perry County, Ohio. W. Anderson.)

Fig. 3. DARK SLATE-COLORED FLINT.
(Cat. No. 113684, U.S.N.M. Flint Ridge, Licking County, Ohio. Gerard Fowke.)

Fig. 4. LIGHT-GRAY FLINT.
(Cat. No. 30175. U.S.N.M. McKenzie, Carroll County, Tennessee. E. H. Randall.)

Fig. 5. LIGHT-GRAY FLINT.
(Cat. No. 58134, U.S.N.M. Fayetteville, Lincoln County, Tennessee. C. S. Grigsby.)

Fig. 6. FAWN-COLORED FLINT.
(Cat. No. 8239. U.S.N.M. Tennessee. J. H. Devereux.)

Fig. 7. STRAW-COLORED FLINT.
(Cat. No. 99307, U.S.N.M. Boone County, Missouri. G. W. Clemens.)

Fig. 8. PALE-YELLOW FLINT.
(Cat. No. 19965, U.S.N.M. Franklin, Williamson County, Tennessee. W. M. Clarke.)

Fig. 9. FAWN-COLORED FLINT.
(Cat. No. 98375, U.S.N.M. Lauderdale County, Alabama. Frank Burns.)

Fig. 10. LIGHT SILVER-GRAY FLINT.
(Cat. No. 97641, U.S.N.M. Monteur's Point, near Vincennes. Indiana. Robert Ridgway.)

Fig. 11. LEAD-COLORED FLINT.
(Cat. No. 32645, U.S.N.M. Murphysborough, Jackson County, Illinois. W. Anderson.)

Fig. 12. YELLOW FLINT.
(Cat. No. 171450, U.S.N.M. Waynesboro, Georgia. Dr. Roland Steiner.)

Fig. 13. REDDISH-BROWN FLINT.
(Cat. No. 171450*a*, U.S.N.M. Waynesboro, Georgia. Dr. Roland Steiner.)

Fig. 14. BROWN JASPERY FLINT.
(Cat. No. 171450*b*, U.S.N.M. Waynesboro, Georgia. Dr. Roland Steiner.)

Fig. 15. DARK SLATE-COLORED FLINT.
(Cat. No. 171450*c*, U.S.N.M. Waynesboro, Georgia. Dr. Roland Steiner.)

pointed. The notches which have formed the barbs have been made in the base and not in the edge. They are V-shaped and are perpendicular to the plane of the implement. The barbs continue on the line of the outside edges, and the widest place is across their extreme points. The material is reported as pale-brown flint, but it has the peculiarity of a brilliant shining luster resembling the brightest patina. Whether it is really patina, or only vitreous material, the author has not been able to determine. The specimen is too precious to be broken in order to show its interior.

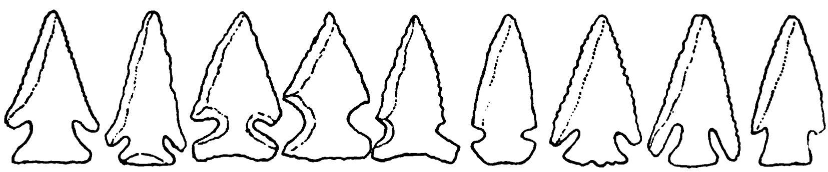
Fig. 178 is barbed and, therefore, belongs to this class. It is broadest near the point. Its edges are of irregular convexity; there have been some others of much the same form as this, but their edges have been straight where this is convex, and instead of a curve there was a distinct angle, but these are considered only the peculiarities of the workman and to have served no particular end, while their rarity will not permit their being assigned a division by themselves.

Fig. 179 is one of the beautiful pale-green jasper specimens of diminutive size, delicate stem, and long, projecting, finely pointed barbs, peculiar to the Pacific coast, coming mostly from Oregon. It appears much smaller than its dimensions given in the legend would indicate. This is caused by its delicacy and fineness. Italy produces the only arrowpoints which compare with those of the Pacific coast in these fine qualities. The reader is referred to Plate 36 for other specimens.

DIVISION IV—PECULIAR FORMS.

This division includes those specimens which have such peculiarities as distinguish and separate them from the standard types. If the distribution of these specimens was general, or if they were found in numbers approximately equal with the others, they would themselves become standard types and each require a division of its own. It is because they do not belong to standard types, and are restricted in number or locality, that they are assigned to this division.

CLASS A.—BEVELED EDGES. (Plate 37.)



The blades of the ordinary arrowpoint are usually chipped from both sides so that the edges are formed on the central line, and a cross section is elliptical. This Class A is peculiar in that the chipping by which the edge is formed is all done from one side, and the edge is thrown or beveled to the plane of the other side. A cross section will

be rhomboidal, the two long sides being the width, and the two short sides or edges being the thickness of the blade.

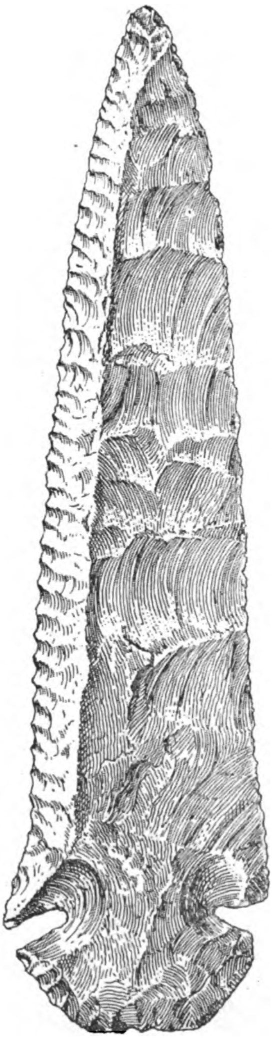


Fig. 180.
PECULIAR FORM OF ARROWPOINT, WITH BEVELED EDGES.
Elkton, Giles County, Tennessee.
Division IV, Class A.
Natural size.

It was for a long time believed that these bevel-edged arrowheads were simply freaks of the workmen, and were without signification or intention for particular purpose. Indeed that belief has not entirely passed away. Since beginning this paper the author, in order to demonstrate the truth of the matter, inaugurated a series of experiments. Selecting from the Museum collection a dozen or more representative specimens, he attached to each an arrow shaft, smooth, straight, without feathering, and the same size throughout. Repairing with these to the top of the tower of the Smithsonian building, he began by letting them drop straight to the ground, carried only with their own gravity, and next launching them in the air in every direction. He found a universal rotation. He pushed his experiments further by arranging these specimens in a sort of clamp of wire, the ends of which embraced the ends of the arrowpoints, care being taken to put the point of contact as near the center of gravity as possible. Thus held, the suspended or clamped implement was free to rotate longitudinally in either direction on the application of the slightest force. This machine was then used by pushing it with its clamped arrowpoint rapidly through the water in a large tub, and it was discovered that the resistance of the water produced a rotary motion of the implement. A more conclusive test was made at a machine shop where the arrowpoint, hung as aforesaid, was presented point foremost to the pipe of air from the driving fan, when the current immediately set it revolving. When the force of the current was increased, it increased the rapidity of the rotary movement. When the arrowpoint was turned about so as to present its base to the current of air, no rotary motion was produced.

These experiments were extended and continued to include any and every kind of bevel-edged arrowpoint and spearhead, always with the same result. It was obvious that the arrowpoint at rest presented to

a rapidly moving current of air would have the same effect as an arrowpoint shot from the bow. Most of the specimens of bevel-edged arrowpoints and spearheads are chamfered one way, so that the movement usually was from right to left, contrary to the motion of the sun. All specimens of this kind employed in our experiments had that rotary motion from right to left A few specimens, however, are made with the bevel the other way, and when they were presented to the current of air their rotary motion was in the opposite direction.

It is proper to add that these experiments were pushed to such extent and in such number, with such repetition of the same result, as to be conclusive that, whatever may have been the intention of the maker of the arrowpoints, the fact was that in their flight through the air the beveled edges produced the rotary motion.

Fig. 181.
PECULIAR FORM OF ARROWPOINT, WITH BEVELED EDGES.
Tennessee.
Division IV, Class A.
$3\frac{1}{4}$ x $1\frac{1}{4}$ x $\frac{1}{4}$.
Cat. No. 8239, U.S.N.M.

While it would appear that this rotary motion must have been intended by the arrow maker when he made the beveled edge, yet the difficulty of solution of the problem why he made it thus is much increased when we consider the greater ease, the less labor, and the increased facility with which he might have accomplished the same rotary motion by twisting the feathers on the arrow shaft. Yet we find this exceeding rare; out of a thousand arrow shafts in the U. S. National Museum not more than a dozen have been found with twisted feathering.

Fig. 182.
PECULIAR FORM OF ARROWPOINT, WITH BEVELED EDGES.
Point Lick, Kentucky.
Division IV, Class A.
$2\frac{1}{2}$ x $1\frac{1}{2}$ x $\frac{3}{16}$.
Cat. No. 18084, U.S.N.M.

The bevel-edged arrowpoint is peculiar in its distribution. It is confined to the interior and southern United States.

Fig. 180 (Cat. No. 18800, U.S.N.M.) is one of these bevel-edged arrowpoints, which, on account of its size, form, and definitely beveled edges, has been chosen and is here represented full size as a characteristic bevel-edged weapon. It is of light-brown flint and comes from Elkton, Giles County, Tennessee. Its base is convex and smoothed, as usual. It is notched, shouldered, and barbed and, but for the peculiarity of its beveled edges, would be placed in Class C, Division III.

Fig. 183.
PECULIAR FORM OF ARROWPOINT, WITH BEVELED EDGES
Louisville, Kentucky.
Division IV, Class A.
$2\frac{1}{2}$ x $1\frac{3}{8}$ x $\frac{3}{8}$.
Cat. No. 19946, U.S.N.M.

Fig. 181 is the size of the average arrowpoint. It is $3\frac{1}{4}$ inches long, $1\frac{1}{4}$ inches wide, and from this size they descend to the smallest. The edges of this specimen are nearly straight, the base is concave, and the

notches which form it are made in the edges near the base. The angle of the shoulders form the usual barb; the projecting corners of the base may also form another pair of barbs. If the arrow shaft used on this specimen should be small in diameter, the points of the base would project beyond it, and thus form a double set of barbs.

Fig. 182 has the appearance of gray flint, but it is of translucent crystalline structure, and an inspection identifies it as chalcedony or chalcedonic flint. Its edges are curved, a union of concave and convex, making them slightly ogee. The base is straight, the barbs are long and thin, and, what is rare, are nearly the same size their entire length. The notch which forms them begins at the corners of the base and edge and, ascending at an angle of about 45 degrees toward the center of the implement, is one-half an inch long and only one-eighth of an inch thick or wide.

Fig. 183 is from Kentucky, gray flint, stemmed, shouldered, and barbed, and twisted to the left. The specimens of this class average from one-fourth to three-eighths of an inch in thickness, and are of all sizes and lengths. Reference is made to Plate 37 for other specimens.

Rev. J. G. Wood,[1] author of The Natural History of Man, describes arrows with a rotary motion, which he says are used with the blowgun:

> Rotary motion was communicated to the arrows in their flight by attaching to their lower ends two feathers—one from the right wing, the other from the left wing of a bird—which acted obliquely against the air and thus imparted the rotary motion required.

CLASS B.—SERRATED EDGES. (Plate 38, figs. 1-9.)

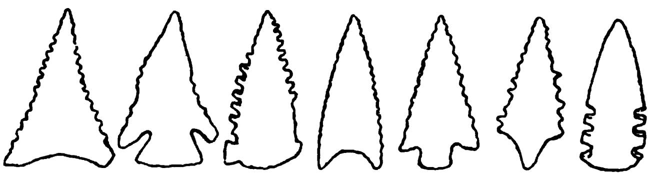


Fig. 184.
PECULIAR FORM OF ARROWPOINT, WITH SERRATED EDGES.
Oregon.
Division IV, Class B.
$7\frac{1}{8} \times \frac{3}{4} \times \frac{1}{4}$.
Cat. No. 12776, U.S.N.M.

These may be of the usual types as to form, stem, barb, etc., but the serrated edge is a peculiarity sufficiently marked to prevent their being assigned to their respective types. The edges are jagged like sawteeth, and the serrations about the same size and frequency as a moderately fine handsaw. They are not the result of hazard in chipping, but are made by pressure with a pointed flaker exerted on the edges from alternate sides and at intervals, and are done with a purpose.

Fig. 185.
PECULIAR FORM OF ARROWPOINT, WITH SERRATED EDGES.
Stockton, San Joaquin County, California.
Division IV, Class B.
$1\frac{1}{4} \times \frac{9}{16} \times \frac{3}{16}$.
Cat. No. 43099, U.S.N.M.

[1] Anthropological Review, VII, 1869, p. lxxi.

EXPLANATION OF PLATE 38.

B.

1 2 2 3 4 5 6 7 8 9

C.

19 18 17 16 15 14 13 12 11 10

D.

20 21 22 23 24 25 26 27

PECULIAR FORMS OF ARROWPOINTS, SPEARHEADS, OR KNIVES.

Class B.

Fig. 1. LIGHT-BROWN FLINT.
(Cat. No. 171437, U.S.N.M. Waynesboro, Burke County, Georgia. Dr. Roland Steiner.)

Fig. 2. YELLOWISH-BROWN FLINT.
(Cat. No. 171437*a*, U.S.N.M. Waynesboro, Burke County, Georgia. Dr. Roland Steiner.)

Fig. 3. FAWN-COLORED FLINT.
(Cat. No. 98403, U.S.N.M. Crawford County, Indiana. John H. Lemon.)

Fig. 4. OBSIDIAN.
(Cat. No. 42646, U.S.N.M. Stockton, San Joaquin County, California. L. Belding.)

Fig. 5. LIGHT-BROWN FLINT.
(Cat. No. 171437*b*, U.S.N.M. Waynesboro, Burke County, Georgia. Dr. Roland Steiner.)

Fig. 6. LIGHT-BROWN FLINT.
(Cat. No. 132199, U.S.N.M. Burke County, Georgia. McGlashan collection.)

Fig. 7. BROWN FLINT.
(Cat. No. 171444, U.S.N.M. Waynesboro, Burke County, Georgia. Dr. Roland Steiner.)

Fig. 8. BLUE-GRAY FLINT.
(Cat. No. 12776, U.S.N.M. Oregon. Paul Schumacher.)

Fig. 9. OBSIDIAN.
(Cat. No. 43029, U.S.N.M. Stockton, San Joaquin County, California. L. Belding.)

Class C.

Fig. 10. FAWN-COLORED FLINT.
(Cat. No. 21155, U.S.N.M. New Braunfels, Comal County, Texas. F. Lindheimer.)

Fig. 11. GRAY-BROWN FLINT.
(Cat. No. 61444, U.S.N.M. Austin, Travis County, Texas. George Stolley.)

Fig. 12. GRAY-BROWN FLINT.
(Cat. No. 8239, U.S.N.M. Tennessee. J. H. Devereux.)

Fig. 13. DARK SLATE-COLORED FLINT.
(Cat. No. 60459, U.S.N.M. Clinton, Feliciana County, Louisiana. John W. Roberts.)

Fig. 14. CLAY IRONSTONE.
(Cat. No. 5891, U.S.N.M. East Windsor, Hartford County, Connecticut. D. W. Wood.)

Fig. 15. BLUE-BLACK FLINT.
(Cat. No. 35302, U.S.N.M. Valley of the Ohio River. W. M. H. De Haas.)

Fig. 16. OBSIDIAN.
(Cat. No. 19610, U.S.N.M. Susanville, Lassen County, California. Stephen Powers.)

Fig. 17. BLACK FLINT.
(Cat. No. 23265, U.S.N.M. Etowah Mounds, Bartow County, Georgia. B. B. Gideon.)

Fig. 18. DARK-GRAY FLINT.
(Cat. No. 6170, U.S.N.M. Lockport, Niagara County, New York. Col. E. Jewett.)

Fig. 19. DARK SLATE-COLORED FLINT.
(Cat. No. 16682, U.S.N.M. Peotone, Will County, Illinois. D. H. Eaton.)

Class D.

Figs. 20, 23. STRAW-COLORED FLINT.
(Cat. Nos. 132235, 132226, U.S.N.M. Burke County, Georgia. McGlashan collection.)

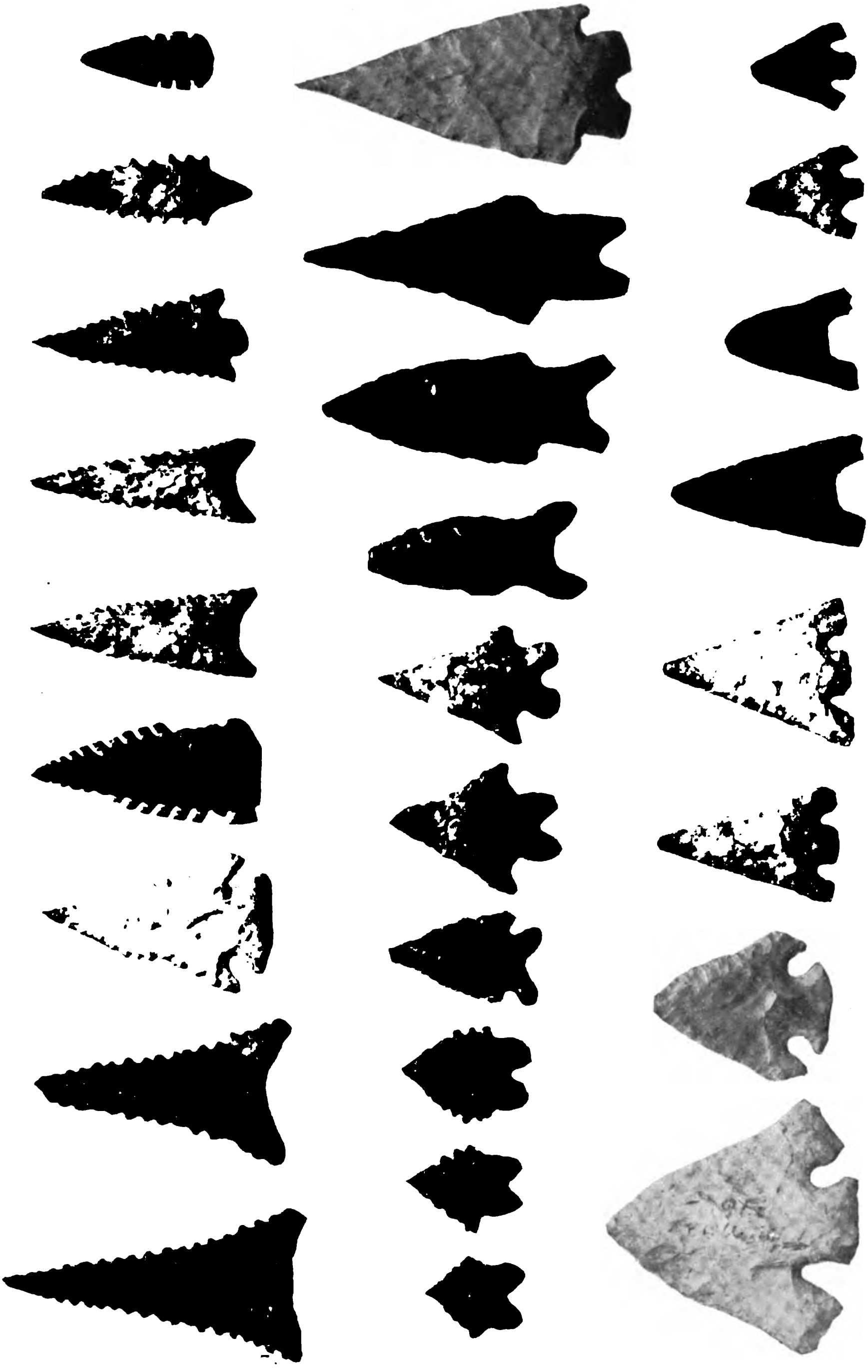
Fig. 21. YELLOWISH-BROWN FLINT.
(Cat. No. 132189, U.S.N.M. Burke County, Georgia. McGlashan collection.)

Fig. 22. FAWN-COLORED FLINT.
(Cat. No. 132189*a*, U.S.N.M. Burke County, Georgia. McGlashan collection.)

Figs. 24, 25. FAWN-COLORED FLINT.
(Cat. Nos. 9631, 9631*a*, U.S.N.M. County Derry, Ireland. R. Day, jr.)

Fig. 26. BLUE-GRAY FLINT.
(Cat. No. 11130, U.S.N.M. Scarborough, Yorkshire, England. W. A. Baker.)

Fig. 27. FAWN-COLORED FLINT.
(Cat. No. 11121, U.S.N.M. County Armagh, Ireland. W. [illegible]ter.)

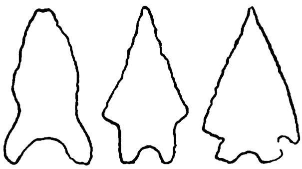


PECULIAR FORMS OF ARROWPOINTS, SPEARHEADS, OR KNIVES.

Classes B, C, and D.

Figs. 184 and 185 are specimens of this class. Both are from the Pacific coast. The former is stemmed and shouldered, with pointed base, and would belong to Class B, stemmed; while the latter is leaf-shaped, with convex base, and would belong to Class B, leaf-shaped, but for its serrated edges. The edges of the former are serrated from the shoulder to the point; those of the latter have but three serrations near the base, but the implement is so small that slight entry into the flesh brings the serrations into use. A series of this class is represented on Plate 38, figs. 1–9.

CLASS C.—BIFURCATED STEMS. (Plate 38, figs. 10–19.)



These may be of standard types of any class of the stemmed division, either shouldered or barbed, with edges concave, straight, or convex; but, as in the class with serrated edges, here the bifurcated stem is a peculiarity so marked as to transfer it to this division (fig. 186).

Usually the bifurcated stem is neither expanding nor contracting, but is straight, with parallel edges. What would otherwise be the base is here occupied by a V-shaped notch. It is made by the same method as is the notch forming the shoulder, namely, chipping the flakes always in the same place by pressure exerted alternately from each side.

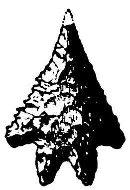


Fig. 186.
PECULIAR FORM OF ARROWPOINT, WITH BIFURCATED STEM.
Tennessee.
Division IV, Class C.
1¾ x 1⅛ x ⅛.
Cat. No. 8935, U.S.N.M.

The flakes may have converted the former straight base into a V-shaped notch, which must have served for the insertion of the split shaft or handle. When shafted or handled the bifurcation would be hid, but it would seem to have afforded a firmer fastening.

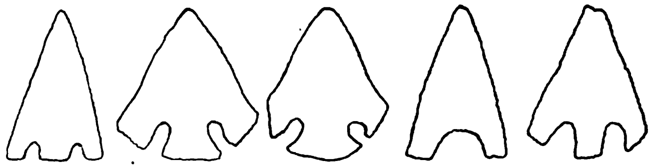
From observations of specimens, it appears that arrowpoints of this size need not have been fastened firmly, but were as frequently lashed so as to wobble and possibly be detached from the shaft and left in the wound.[1]

As the only attainment of the bifurcated stem appears to have afforded a firmer fastening (which was not needed for arrows, but was for knives), it is suggested that these may have been intended for knives and not for arrows. The well defined difference between the two classes and their existence and employment

[1] Cases are cited in the works on arrow wounds where the arrowpoint, having entered the body, the forcible withdrawal of the shaft has left the head or pile in the body. Many such cases have been observed by the surgeons of the Army and reported to the Surgeon-General's Office, while the remains themselves have been sent to and are now to be seen in the Army Medical Museum.

in the same locality, with a preponderance in number of those not bifurcated, points to the same conclusion. If the shaft or handle was cut out so as to receive the stem and also to fit the bifurcation, and then pressed in hard and lashed with sinews after the manner of arrowpoints, one can easily see that the bifurcation would increase the firmness of the blade in its handle. Reference is made to Plate 38, Nos. 10-19, for other specimens.

CLASS D.—EXTREMELY LONG BARBS, SQUARE AT ENDS, FINELY CHIPPED. (Plate 38, figs. 20-27.)



These are peculiar in that they are restricted to certain localities. Sir John Evans says they are found in some parts of England and Ireland. A beautiful specimen is figured by him,[1] found by Canon W. Greenwell at Rudstone, near Bridlington, which is here reproduced as fig. 187. They much resemble the Queen's "broad arrow."

Fig. 187.

PECULIAR FORM OF ARROWPOINT, WITH EXTREMELY LONG BARBS, SQUARE AT ENDS.

Rudston, England.

Division IV, Class D.

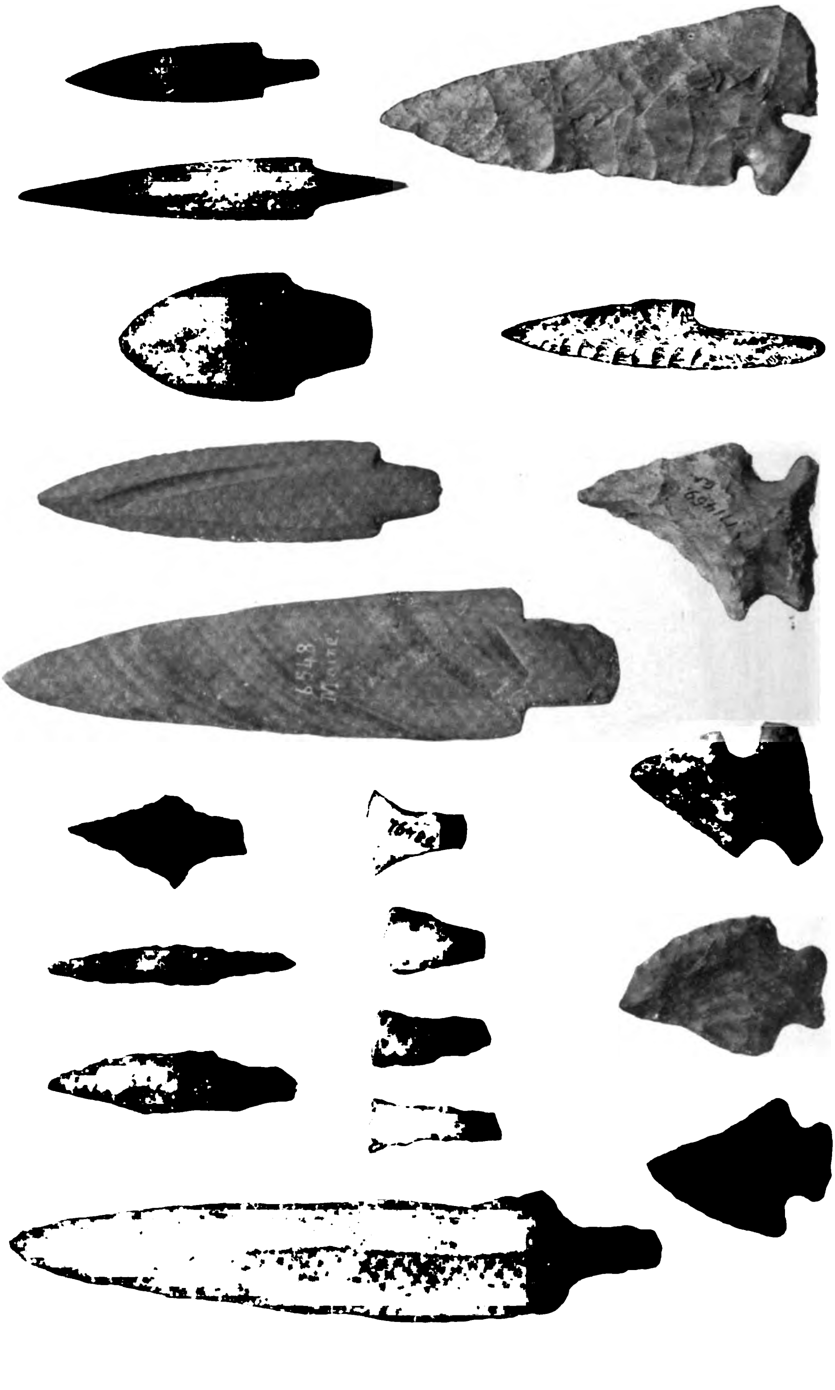
Found by Canon W. Greenwell.

Our interest in this class arises from the fact that, while they are confined to restricted localities in Europe as mentioned, they should have appeared in America in an equally circumscribed area, namely, the State of Georgia. Figs. 20 to 23 on Plate 38 are of this class and form part of the McGlashan and Steiner collections from that State.

De Mortillet mentions them and calls them "pointes de flèche à barbelures Equarries," and assigns them to the first epoch of bronze, the Morgien. He figures one[2] in the Musée St. Germain as from the north of Ireland and collected by Sir John Evans. It has no stem, its base is concave, and the barbs are long, with parallel edges and square ends. Others, from Loir-et-Cher, have stems. The edges of the barbs are parallel and the ends are straight, but instead of being square—that is, at right angles—one is oblique inward and the other outward. Remark this difference in Figs. 20-23 of Plate 38.

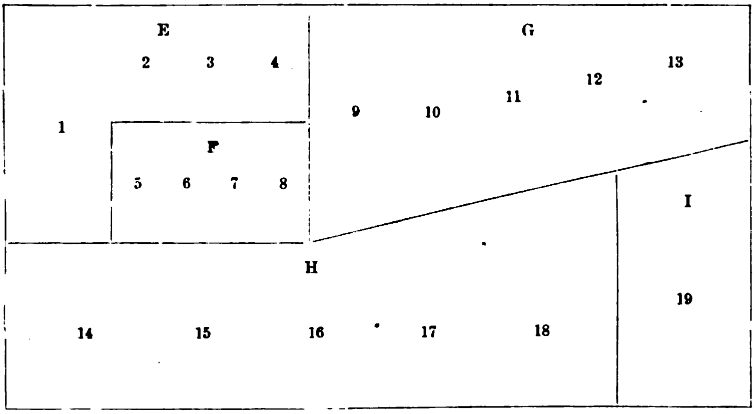
[1] Ancient Stone Implements, p. 343, fig. 318.

[2] Musée Préhistorique, pl. XLIII, fig. 373.



PECULIAR FORMS OF ARROWPOINTS, SPEARHEADS, OR KNIVES.
Classes E, F, G, H, and I.

EXPLANATION OF PLATE 39.



Peculiar Forms of Arrowpoints, Spearheads, or Knives.

Class E.

Fig. 1. Fine-grained tufa.
(Cat. No. 98478, U.S.N.M. Chiriqui, Panama, U. S. Colombia. J. A. McNiel.)

Fig. 2. Reddish jasper.
(Cat. No. 98477, U.S.N.M. Chiriqui. J. A. McNiel.)

Fig. 3. Straw-colored flint.
(Cat. No. 58489, U.S.N.M. Denmark: Royal Museum, Copenhagen.)

Fig. 4. Dark-brown jasper.
(Cat. No. 98476, U.S.N.M. Chiriqui J. A. McNiel.)

Class F.

Fig. 5. Light-gray flint.
(Cat. No. 58490, U S.N.M. Denmark: Royal Museum, Copenhagen.)

Fig. 6. Pale-yellow flint.
(Cat. No. 149579, U.S.N.M. Loir-et-Cher, France. Thomas Wilson.)

Fig. 7. Light-gray, translucent flint.
(Cat. No. 149579*a*, U.S.N.M. Loir-et-Cher, France. Thomas Wilson.)

Fig. 8. Light-gray flint.
(Cat. No. 58491, U.S.N.M. Denmark; Royal Museum, Copenhagen.)

Class G.

Fig. 9. Gray-banded slate, oval, without ridges.
(Cat. No. 6548, U.S.N.M. St. Croix River, Maine. G. A. Boardman.)

Fig. 10. Dark-gray slate, oval, with ridges.
(Cat. No. 62097, U.S.N.M. Alaska. C. L. McKay.)

Fig. 11. Dark-gray slate, oval, with slight ridges.
(Cat. No. 30758, U.S.N.M. Seneca River, New York. W. M. Beauchamp.)

Fig. 12. Light-gray slate, with ridges, diamond in section.
(Cat. No. 140904, U.S.N.M. Korea. P. L. Jouy.)

Fig. 13. Gary flint, with ridges, diamond in section.
(Cat. No. 140904*a*, U.S.N.M. Korea. P. L. Jouy.)

Class H.

Fig. 14. Brown jasper.
(Cat. No. 35767, U.S.N.M. Haldemans Island, Susquehanna River, Pennsylvania. F. G. Galbraith.)

Fig. 15. Black flint.
(Cat. No. 6694, U.S.N.M. Berks County, Pennsylvania. G. M. Keim.)

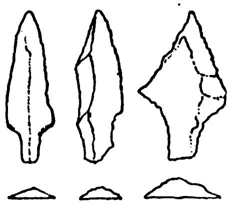
Figs. 16, 17. Light-gray flint, with straw-colored patine.
(Cat. Nos. 171459, 171459*a*, U.S.N.M. Waynesboro, Burke County, Georgia. Dr. Roland Steiner.)

Fig. 18. Flint (Solutréen point).
(Original in Museum of St. Germain. De Mortillet, Musée Prehistorique, fig. 108, pl. xviii. Grotte de l'Église (Dordogne), France.)

Class I.

Fig. 19. Blue-gray flint.
(Cat. No. 99224, U.S.N.M. San Saba County, Texas. A. R. Roessler.)

CLASS E.—TRIANGULAR IN SECTION. (Plate 39, figs. 1–4.)



These are thin and narrow rude flakes struck from nuclei and left nearly in their original condition except that a rude stem has been chipped, and where necessary they have been brought to a point. They are peculiar in being made triangular in section and that they are restricted to the province of Chiriqui, Panama. The U. S. National Museum is indebted to Mr. J. A. McNiel for its specimens, which have been described and figured by Dr. W. H. Holmes.[1]

The larger ones were of fine-grained, slaty-looking tufa, while the smaller were of flinty jasper of reddish and yellowish hues.

Fig. 188 is one of these small jasper specimens from Chiriqui. They are made entirely by chipping, and as the material is hard and refractory, the workmanship is rude. This form is shown in Plate 39, figs. 1 to 4.

Fig. 188.
PECULIAR FORM OF ARROWPOINT, TRIANGULAR IN SECTION, REDDISH JASPER.
Chiriqui, Panama, United States of Colombia.
Division IV, Class E.
Cat. No. 98477, U.S.N.M.

CLASS F.—BROADEST AT CUTTING END—TRANCHANT TRANSVERSAL. (Plate 39, figs. 5–8.)

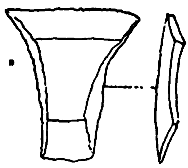


Fig. 189 (*a*, *b*) represents two specimens of this class, and figs. 5 to 8 on Plate 39 represent others. They are thin, almost flake-like in appearance, not made pointed, nor are the edges worked down by secondary chipping. The cutting edge is at the front, at the broadest end, chisel-shaped—tranchant transversal—and, thus propelled, will make a wound large enough for the arrow shaft to follow. Whether these were really arrowpoints, or were used as knives, is a disputed question. De Mortillet devotes Plate XXXIX of the Musée Préhistorique to them, showing fifteen illustrations (figs. 319–334). One of them, from Denmark, is still lashed to its shaft or handle by threads or fibers of bark. The instrument (fig. 190*a*) is small enough for an

[1] Sixth Annual Report of the Bureau of Ethnology, 1884–85, pp. 33, 34.

arrow, but the handle is short enough for a knife; whether the shaft was broken before being placed in its grave can not be known.

Fig. 190 (*b*) represents another specimen of the same class, from a neolithic grave at Montiguy-l'Engrain (Aisne) France. It is inserted in a horn handle and shows this particular specimen to have served as a knife, possibly for trepanation, and not as an arrow.

Similar specimens have been found throughout western Europe. A cache of some thousand was opened and is now displayed in the museum at Copenhagen. Another was described by M. Edmond Vielle.[1]

There is an implement peculiar to Scandinavia of the same form as the tranchant transversal. They have been called in French "tranchet." From their resemblance to the tranchant transversal they are supposed to have been the same implement and intended for the same use, but this conclusion has not been accepted. The principal difference between those of Scandinavia and of other countries is their respective sizes. Those of Scandinavia are larger, so much so as to interdict all possible use as arrowpoints or spearheads. Many of them are large enough to have required to be held in the hand for use. It is the accepted belief that they served rather as hatchets, and that their cutting was done by strokes as in chopping. It is also charged that they belonged to an earlier epoch than their smaller partners, this having been determined by the conditions and stratum of their deposit and the objects with which they were found associated. No opinion is expressed as to the correctness of this belief of the use of the tranchet. As much as can be said at the present is a warning that an objection made to the large tranchet in Scandinavia shall not necessarily defeat the ideas of the similar use for the smaller ones in France and other parts of Europe.

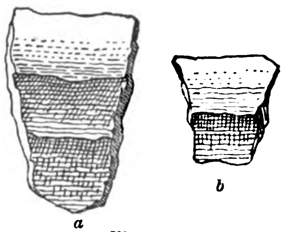


Fig. 189.
PECULIAR FORMS OF ARROWPOINTS, BROADEST AT CUTTING END—TRANCHANT TRANSVERSAL.
Aisne, France.
Division IV, Class F.

Whatever may be said in opposition to the use of the small tranchant transversal as an arrowpoint or spearhead, it must be admitted that they have been found in such numbers in numerous and widely separated localities, and extending over such an area of Europe as to make it difficult to determine for what purpose they were intended, if not for that.

The greatest contention as to its possible use grows out of its shaft or handle and the mode of attachment, by which it is sought to be determined whether it was used as an arrowpoint or spearhead, or as a knife; but all this discussion is of slight value viewed from the standpoint of this paper, for it must be admitted that these implements were prehistoric and intended for a use involving cutting, scraping, or piercing. The piercing use would decide it to be an arrowpoint or spearhead, which would naturally require an attachment to an arrow or spear shaft. But suppose that they would be found attached to a

[1] Bulletins de la Société d'Anthropologie, 1890, p. 959.

shorter shaft or handle, then they might serve as knives and as such would be entitled to consideration here. This supposed difference in the shaft or handle applies equally to other implements which have passed throughout all time as arrowpoints or spearheads. For, as has been shown in its appropriate place, the particular use of the ordinary arrowpoint or spearhead is to be determined by the kind of shaft or handle to which it was attached. The size of the implement made no difference; if it was attached to a long and stout shaft it was a spear, if to a shorter one, it was a javelin, if still shorter and smaller, an arrow, while a still shorter one became a handle and determined the implement to be a knife.

As the tranchant transversal must have had some one of these kinds of handles or shafts, the shaft or handle, and not the head, determined its use. It is therefore repeated that, in any event and without deciding the various contentions whether the tranchant transversal was used as an arrowpoint, a spearhead, or a knife, it is still appropriate to be noticed in this paper. It may have been a combination implement and served in many capacities. One suggested by the author as extremely probable is that of a surgical instrument and specially used in trepanation, of which we have seen so many instances in the prehistoric epoch to which these implements belong.

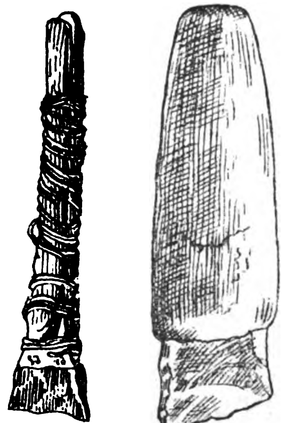


Fig. 190.

PECULIAR FORMS OF ARROWPOINTS—TRANCHANT TRANSVERSAL.

(a) Found in peat moss. Funan, Denmark, in shaft and tied with bast fiber.

Evans, Ancient Stone Implements, etc., p. 365, fig. 344.

(b) From neolithic grave, (Aisne) France, in horn handle.

Dictionnaire des Sciences Anthropologiques, p. 1065, fig. 279.

The U. S. National Museum possesses (Wilson collection) a series of these implements from the station of Teil (Loir-et-Cher, France), collected by M. A. C. Bonnet, of Paris. He has a large collection, having excavated the station and secured its entire contents. He says the station at Teil was evidently inhabited by prehistoric man for a long time. It was on the side of a hill looking toward the south, with a stream of water at the foot, and had everything to recommend it as a place of habitation. There are many localities in western Europe wherein these implements have been found, but they do not require notice or description.

A vertebra, from a grotto near Courjeonnet, in the valley of the Petit Morin (Marne), France, was pierced by a flint arrowpoint of the type tranchant transversal. The grotto in which it was found was sepulchral. All the bones were human, regularly disposed, and their anatomical relations respectively preserved. There would seem to be no doubt that this was used as a projectile. Dr. Hamy, describing the excavations at Les Eyzies in his "Paléontologie Humaine," says:

There are very small arrowpoints, triangular or flattened, filed at their extremities, which form a sharp edge. In figs. 63, 64 one of these points is shown still inserted in the lumbar vertebra of a young reindeer.

This means arrowpoints tranchant transversal, although the name had not then been given to them.

The specimens from Petit Morin confirm Hamy's opinion and the theory that they were used as arrowpoints or projectiles. A skull was found in one of the grottoes of Villevenard, where it, with the other portions of the skeleton, were in their normal position, apparently unchanged in position since the day of burial. A portion of the skull was decayed so that possible wounds were destroyed, but inside of the skull, so placed as to be impossible of entry except through the bone, were found three arrowpoints tranchant transversal. Another of these arrowpoints was found, still at Villevenard, inserted between two dorsal vertebræ. In a burial cave containing thirty subjects, all regularly disposed and the whole grave filled solid, were found no less than seventy-three arrowpoints tranchant transversal. They were disposed in the head and trunk and bore such relation to the skeletons as to show that they had been intimately associated with the body, if not inserted in it, at the time of burial. Baron de Baye found nearly two thousand of these specimens, tranchant transversal, in the grottoes explored by him, and it is impossible to believe, after the evidences found, that they had not been used as projectiles, whether as arrowpoints or spearheads may be left undetermined.

Those who are desirous of continuing the investigations into this subject are referred to the authorities:

"Sur les Flèches à Tranchant Transversal," by Baron Joseph de Baye, in Congrès International d'Anthropologie et Archæologie Préhistoriques. Compte rendu de la 7e session, Stockholm, 1874, I, pp. 271, 272.

"Le Préhistorique," 2d ed., p. 518. By G. De Mortillet.

"Le Musée Préhistorique," pl. XXXIX, figs. 319–334. By G. De Mortillet.

"Pointes de Flèches Typiques de Fere-en-Tardenois (Aisne)," by Edmond Vielle: Bull. de la Soc. d'Anthrop. de Paris, I, (4th ser.), Paris, 1890, pp. 959–964.

"Armes de Jet à Tranchant Transversal, concave ou convexe," by Dr. L. Capitan. Bulletin de la Societe d'Anthropologie de Paris, XII (3d ser.), 1889, pp. 609–620.

"Ancient Stone Implements of Great Britain," by Sir John Evans (Amer. ed.), p. 365.

"Un Depót de Flèches à Tranchant Transversal dans les Stations du Petit-Morin," by Baron Joseph de Baye. Bulletin de la Société d'Anthropologie de Paris, VII (3d ser.), 1884, pp. 202–204.

A communication by M. Dumont[1] argues the affirmative of the proposition at length in a very satisfactory manner. It shows, by Plate IX, that on the Kongo and throughout a large portion of Africa the arrow or spear heads with the broad points, tranchant transversal, are in continued use among the savages. The same idea is elaborated by Dr. Capitan in the study mentioned.

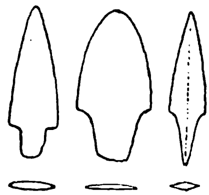
Those who are in opposition to the idea of these being used as arrowpoints are recommended to Dictionnaire des Sciences Anthropologiques, titles "Neolithique," p. 806, and "Tranchet," p. 1064, by Philippe

[1] Bulletin de la Societe d'Anthropologie, Bruxelles, VIII, 1889–90, pp. 176–188.

Salmon, and "Chisel-shaped," by Sir John Evans, Ancient Stone Implements, etc., p. 329, fig. 272 from Egypt, and p. 352, fig. 342, from Scotland.

Two ancient specimens of this type, undoubtedly used as arrows, and coming from France, are shown (figs. 196, 197) in the chapter on 'Arrow wounds,' as having been fired, the first into a human vertebra and the second into a human tibia. While the drawing of these illustrations may not represent the tranchant transversal with exactness, there is no doubt, both from description and examination, that they are of this type.

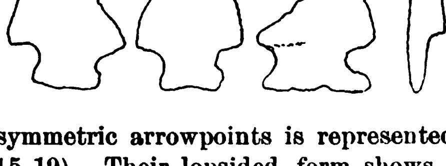
CLASS G.—POLISHED SLATE. (Plate 39, figs. 9-13.)



Specimens of this type are shown on a portion of Plate 39 (figs. 9–13). They are peculiar in that they are found and appear to have been made and used in a restricted locality on the northern Atlantic coast. They are of slate, have been ground or polished on both sides, and made to a smooth edge.

Knives of slate, with a circular cutting edge, fashioned like a saddler's knife, have been found in the same region, where they are said to have been used as fish knives. Both spearheads and knives are identical with Eskimo forms and would suggest possible contact; but it is remarkable, and as yet unexplained, why this material should have been preferred for arrowpoints or spearheads. There is no lack of the usual material in this portion of the country. Mount Kineo furnishes a porphyritic felsite (Mount Kineo flint), which was manufactured into arrowpoints that have been distributed up and down the coast for a long distance.

CLASS H.—ASYMMETRIC. (Plate 39, figs. 15–19.)



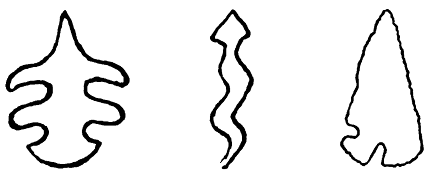
A series of asymmetric arrowpoints is represented in a portion of Plate 39 (figs. 15–19). Their lopsided form shows their peculiarity. It is curious that they should have been made in a way which appar-

ently destroys their effectiveness as a projectile. It is suggested that they may have been fastened to a short handle after the fashion of a knife and then used as concave scrapers; that is to say, for the same purpose as the implements in Plate 26. The convex edge may have been used as a knife.

The long, straight implement (Plate 39, fig. 15) is quite different from these, and yet is asymmetric and to be placed in this class. It belongs to the Solutréen epoch of the Paleolithic period and represents the earliest examples of supposed arrowpoints or spearheads, although they may have been, and probably were, used as harpoons; they come from the well-known cavern district on the Vézère (Dordogne), France. The U. S. National Museum (Wilson collection) possesses two specimens of the same style, but smaller. The Solutréen epoch was proverbial for the excellence of its flint chipping, and these are representative examples.

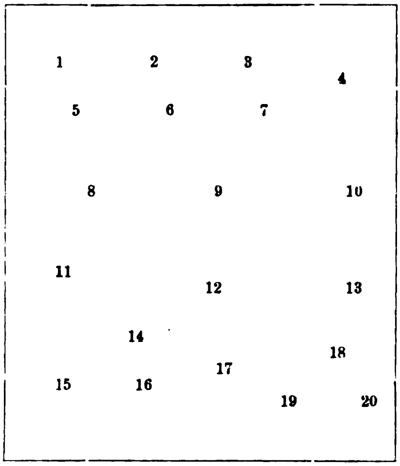
The Steiner collection from Burke County, Georgia, contains a number of asymmetric arrowpoints or spearheads. Figs. 16 and 17, Plate 39, and fig. 195 belong to that collection. They are of the gray flint with yellow patina so common in that country, of which we have so many representatives in the Steiner and McGlashan collections. The remark above made as to the impossibility of their use as projectiles and the probability of their employment as scrapers or knives with short handles, applies to these specimens. Others shown in the plate as belonging to this class have great similarity with the implements to be described in the succeeding chapter on knives. Their asymmetric and lopsided form, the characteristics of their point, and the sharpened edge upon the one side only, the stem suitable for handling, are all evidence of the non-employment of these implements as arrows or spears, or as projectiles.

CLASS I.—CURIOUS FORMS. (Plate 39, fig. 14; Plate 40.)



There have been discovered in different countries, implements which have resemblance to arrowpoints and spearheads in material, method and style of manufacture, and general appearance, though by reason of the peculiarity of their form are totally unfitted for any projectile purpose and, indeed, it is impossible that they should have served as such. Plate 39, fig. 14, shows one of this class, and Plate 40 represents a

EXPLANATION OF PLATE 40.



Peculiar Forms of Arrowpoints, Spearheads, or Knives.

Class I.

Fig. 1. Gray Flint.
(Cat. No. 43132, U.S.N.M. Mound, Naples, Illinois. J. G. Henderson.)

Fig. 2. Obsidian.
(Cat. No. 26417, U.S.N.M. San Miguel Island, California. S. Bowers.)

Fig. 3. Dark-gray Flint.
(Cat. No. 62387, U.S.N.M. Jefferson County, West Virginia. R. W. Mercer.)

Fig. 4. Porphyritic Felsite.
(Cat. No. 9992, U.S.N.M. Shell heaps, Edmunds, Maine. G. T. Gardner.)

Fig. 5. Dark-gray Flint.
(Cat. No. 147751, U.S.N.M. Flint Ridge, Licking County, Ohio. Gerard Fowke.)

Fig. 6. Pale brown Flint.
(Cat. No. 35589, U.S.N.M. Greenfield, Missouri. M. E. Harrison.)

Fig. 7. Pale-brown Flint.
(Cat. No. 147750, U S.N.M. Flint Ridge, Ohio.)

Fig. 8. Pale-gray Flint.
(Cat. No. 15733, U.S.N.M. San Miguel Island, California. W. G. Harford.)

Fig. 9. Gray Flint.
(Cat. No. 145977, U.S.N.M. Flint Ridge, Ohio. Gerard Fowke.)

Fig. 10. Gray Flint.
(Cat. No. 32538, U.S.N.M. Pearl Depot, Illinois. Brainard Mitchell.)

Fig. 11. Gray Flint.
(Cat. No 15732, U.S.N.M. San Miguel Island, California.)

Fig. 12. Pink Flint.
(Cat. No. 32522, U.S.N.M. Pearl Depot, Illinois. Brainard Mitchell.)

Fig. 13. Pale-gray Flint.
(Cat. No. 30127, U.S.N.M. St. Clair County, Illinois. Dr. J. R. Patrick.)

Fig. 14. Grayish Flint.
(Cat. No. 29630 U.S.N.M. San Miguel Island, California. S. Bowers.)

Fig. 15. White Flint.
(Cat. No. 173938, U.S.N.M. Southeast Missouri. Bureau of Ethnology, Hilder collection.)

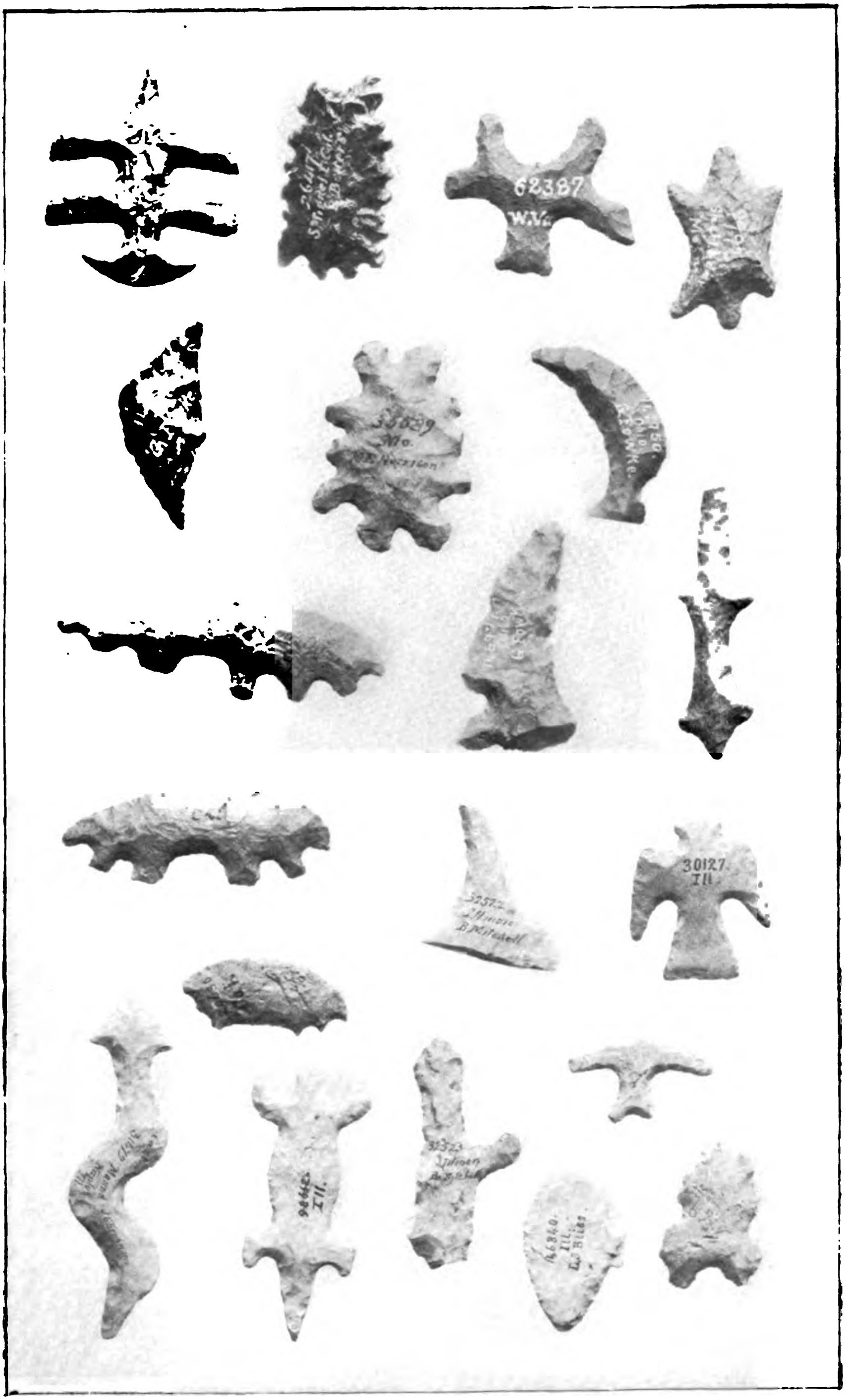
Fig. 16. White Flint.
(Cat. No. 98662, U.S.N.M. (Cast). Greene County, Illinois. C. Armstrong.)

Fig. 17. White Flint.
(Cat. No. 32523, U.S.N.M. Pearl Depot, Illinois. Brainard Mitchell.)

Fig. 18. White Flint.
(103 (?). Missouri.)

Fig. 19. White Flint.
(Cat. No. 146840, U.S.N.M. Dallas City, Illinois. L. S. Bliss.)

Fig. 20. Pinkish Flint.
(Cat. No. 97485, U.S.N.M. Flint Ridge, Ohio. Gerard Fowke.)



PECULIAR FORMS OF ARROWPOINTS, SPEARHEADS, OR KNIVES.
Class I.

series of these curious forms. The latter is taken from the author's paper on Prehistoric Art,[1] where it is thus introduced:

It has been remarked many times throughout this paper that the prehistoric artist possessed sufficient confidence in his ability, and displayed such control over his tools and materials as enabled him to make anything out of flint that his fancy might dictate; he did not confine himself to utilitarian objects, but was an artist in the true sense of the word; that is to say, he dealt with art for art's sake, for the sake of making something which should be beautiful and whose only purpose, according to the canon of art laid down by Sir John Collier, would be to please his eye and to gratify his taste. The prehistoric artist in flint obtained, in some way, we know not how, possibly by study and contemplation, possibly by education, possibly by accident, an ideal which he reproduced in flint. Plate 29 [Plate 40] represents twenty objects taken at hazard from the interior of the United States, principally from the Ohio and Mississippi valleys, all of flint, in curious and rare forms, believed to be entirely without utility and solely to gratify an artistic desire. None of them are arrow or spear heads, and none of them appear to have been made for any service. They are the work of a master who, conscious of his ability, is playing with his art. One represents a bird, one a snake, one an outstretched beaver-skin, two of them, by stretch of the imagination, might represent four-footed animals; the rest have no likeness to any known object. All of them are worked from flint or some similar stone; one is of obsidian; they are represented about natural size. This series shows what the prehistoric artist in flint was able to do in the management and control of his tools and materials in making fanciful objects.

Fig. 191.
ARROWPOINT OF BONE, WITH NARROW GROOVES ON EACH SIDE AND SHARP FLINT FLAKES FASTENED WITH BITUMEN OR GUM.
Sweden.
Cat. No. 101637, U.S.N.M.
Natural size.

These curious forms are not peculiar to the United States. They are found in England,[2] and have also been found scattered through France, Switzerland, and Italy, though rarely.

Fig. 191 is one of the peculiar forms restricted in number and locality. Its restrictions in both these regards are so close that the author has not deemed it necessary to assign it a class or give it a name. These forms are confined to Scandinavia, and are extremely rare even in that country. The specimen figured is from Sweden, was procured by the author, and forms part of the collection in the U. S. National Museum. It is an arrowpoint of bone, sharpened to a fine point, is extremely hard and stiff, and could pierce equal to any flint weapon. Either side is opened with a deep and narrow groove into which have been inserted tiny bits of flint flakes, with sharp cutting edges, fas-

[1] Page 437, pl. 21.
[2] Sir John Evans, Ancient Stone Implements, pp. 350, 351, figs. 336–339.

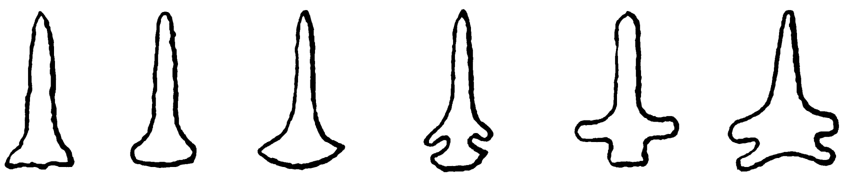
tened with bitumen or gum. Some of these bits of flint have been lost out of the original specimen, but enough remain to show its character and effectiveness as a weapon.[1] Some of the bits of flint suitable for such use have been found and are displayed in the Museum of the Royal Irish Academy.[2]

M. de Mortillet presents, in "Musée Préhistorique,"[3] eight illustrations of spear and lance heads with two poniards, varying in length. Six are from France, of which three are the flint of Grand Pressigny. He makes the following remarks as to their differentiation:

> Lanceheads and poniards of flint in France are smooth on one side, the chipping being always done on the other. In Scandinavia they are chipped on both sides. In France the objects intended for knives have no secondary chipping at all. The cutting edge is left smooth as it was struck from the core; in other words, it is simply a sharp-edged flake.

In his estimation an object from France like the Mousterien point (figs. 3, 4), untouched on one side but wrought to an edge on the other, would be a spear or lance head, while a flake like that from Grand Pressigny (Plate 7, fig. 4), sharp but untouched on the edge, would be a knife. His Plate XLII contains illustrations of javelin points, large arrowpoints, of which five are from France (four of flint and one of bone), three are from the United States, the others from Russia and Scandinavia. His Plates XLIII and XLIV contain 41 illustrations of arrowpoints, of nearly every form and style (figs. 365–405). France has 21 representatives, Italy 4, Switzerland and Denmark each 3, Ireland, Portugal, and America each 2, Prussia, Sweden, and Algeria each 1. These are of the usual types, though some may have particular forms peculiar to certain countries. His Plate XLV contains four illustrations of the mode of fastening the arrowpoints to the shaft, three from the lake dwellings of Switzerland, and one from California; two are of stone and one of bone.

CLASS K.—PERFORATORS.



An anomaly in arrowpoints should not be overlooked. One of the prehistoric implements of America is that which usually has been called the perforator or drill, though sometimes, jocularly, "hairpin." It consists of the bore or pile, which is round or nearly so, pointed as though suitable for drilling or boring, with a stem or base after the fash-

[1] Montelius, Civilization of Sweden in Heathen Times, p. 25, fig. 25.
[2] Sir W. Wilde, Catalogue of the Royal Irish Academy, I, p. 10; p. 254, fig. 163.
[3] Plate XLI.

ion of arrowpoints. It has usually been supposed that this spreading base was to be held between the thumb and fingers, gimlet fashion, and used as a drill. Some of these implements appear to have been made primarily for this purpose, while others have the full and complete base, stem, shoulders, and sometimes barbs, of the stem end of an arrowpoint, and of these it has always been said or supposed, that the perforator or drill had a secondary use, and was possibly a broken arrowpoint. The blade is chipped away on either edge until the pile or bore is very nearly round and quite pointed. These have never been classed as arrowpoints or spearheads, but it is curious to remark that the only wounds shown in the two human skulls in the U. S. National Museum should have been made by stone implements or arrowpoints of this peculiar kind. Reference is made to figs. 198 and 200, where the skulls are represented with the wound and weapon as originally found, but the latter are also withdrawn and shown in their entirety. With this apparently conclusive evidence of their use as arrowpoints, they can not be omitted from this classification.

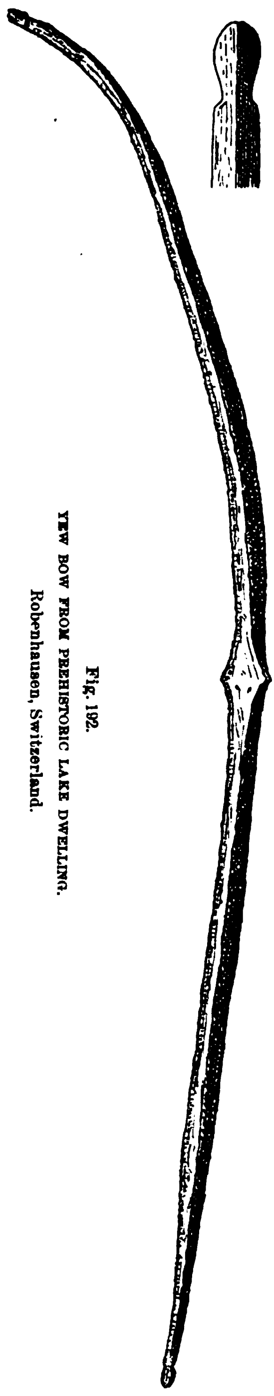


Fig. 192.
YEW BOW FROM PREHISTORIC LAKE DWELLING.
Robenhausen, Switzerland.

The bow and arrow as a projectile engine comprises several parts. This paper has treated only one, the arrowpoint or pile, as it is called in archery, for the reason that the investigation has been confined in point of time to the prehistoric, and all or nearly all parts of the engine, except the stone arrowpoint, have decayed or been destroyed by lapse of time. Bows with their strings, arrow shafts with their feathering, spear shafts, and, with a few excepted illustrations to be given, knife handles, have all perished. Dr. Otis T. Mason says:[1]

> Of the ancient inhabitants of this continent the perishable material of arrows constituting the shaft and other parts has rotted and left us naught but the stone heads. Even those of bone and wood and other material have passed away, so as to leave the impression that the Indians of this eastern region used only stone; but all authorities agree that other substances were employed quite as frequently as the last named.

[1] North American Bows, Arrows, and Quivers, Smithsonian Report, 1893, p. 654.

A single specimen of a bow was preserved in the bog peat of the lake dwellers and has been found and exhibited to the eye of man—"only this, and nothing more." Fig. 192 represents the original of this specimen, now in the museum in Zurich, Switzerland, and found by Jacob Messikommer in the peat bog which was originally the lake dwelling of Robenhausen. The author has visited this station more than once and has found many pieces of wood well preserved. The piles themselves in this, as in all other pile dwellings, are of wood, and almost every museum possesses specimens in certain stages of preservation. The work on this specimen identifies it specifically as a bow. The end "horns" show the notch for the retention of the bow string, while the center has a certain style of decoration.

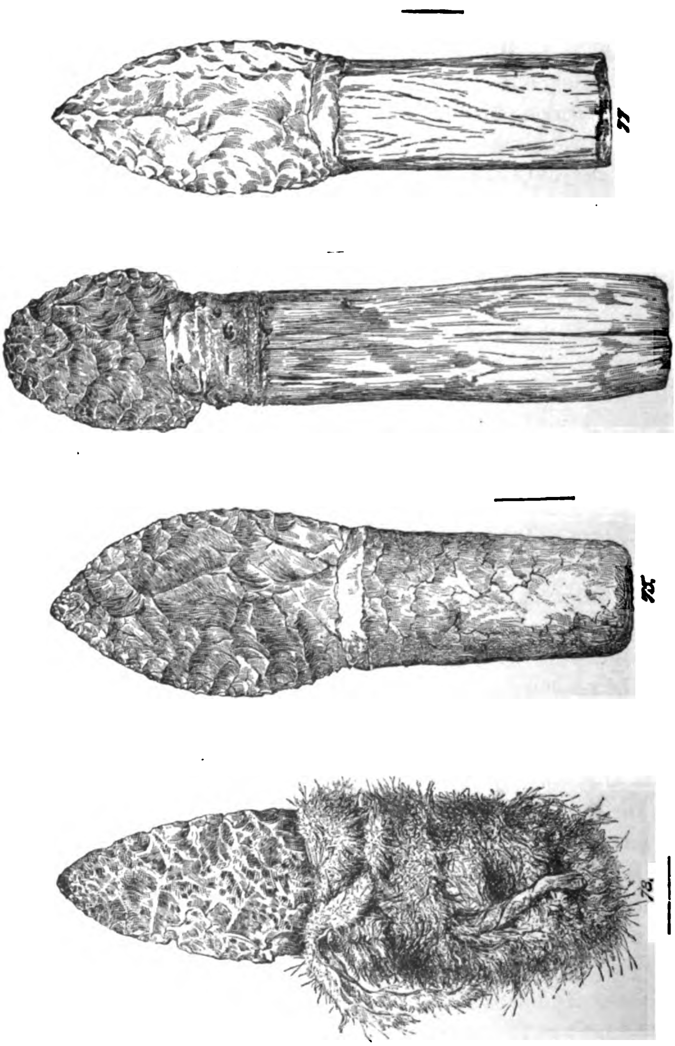
Those interested in ancient bows, or bows of primitive, not prehistoric, peoples are referred to Doctor Mason's paper.

IX. KNIVES.

Mention has previously been made of the possibility of the use by prehistoric man of the implements described in this paper for other purposes than as arrowpoints or spearheads (pp. 823, 935, 938, 977). The importance of the subject requires further investigation.

Reference to the classification of these implements will show many varieties, such as leaf-shaped, triangular, stemmed, notched, shouldered, and barbed, yet all these are variations only in details, the general form, the material, and the processes of manufacture being the same. The principal differences between the various kinds, those most affecting their use and purpose, are in size and weight. It seems strange that implements of such similarity in all functional characteristics should differ so much in size and weight, and it is unreasonable to believe that implements of such extremes—one very light and small, the other large and heavy—could have been employed in the same manner or have served the same purpose. It would indeed be strange if implements 15 or more inches long, as the Arvedsen specimen (Plate 65), or those in Plates 61 and 64 in this paper and Plate 27 in "Prehistoric Art," over 12 inches in length, should have been employed in the same manner and for the same purpose as the small obsidian or jasper "jewel points" from California and Oregon. Yet these are of the same material, have the same style and mode of manufacture, their principal, if not their only, difference being in size and weight.

These implements, with their extreme variations, are not confined to any particular locality or country. The large, finely wrought, leaf-shaped blades have been found in Mexico as well as in central France,



FLINT AND OBSIDIAN LEAF-SHAPED BLADES, HANDLED AS KNIVES.

Hupa Valley, California.

U. S. National Museum.

and the small "jewel points" are found in California and Oregon as well as in Italy, with a sprinkling of each scattered over western Europe.

The handle or shaft to which these implements were fastened and with which they were used may assist us in their classification. Imagine a hickory sapling 10 or 12 feet long, which can best be understood by the average American boy when described as a "hoop-pole," cut, smoothed, seasoned, toughened, or hardened by fire, 1½ inches in diameter at the butt and tapering to a half or three-quarters of an inch at the top, into which one of the small jewel points had been inserted. This implement, held in the hands and used for thrusting, would undoubtedly be called a spear or lance. If the length of the handle was reduced to 4 or 6 feet, it would be a javelin suitable for throwing; with a light reed or cane shaft 2 or 3 feet in length it would be an arrow; and with a handle, however large, if but 3 or 4 inches in length, the implement would become a knife (Plates 41–43). The same classification applies to a larger implement attached to a larger or longer shaft equally well as to the smaller implement with the shorter shaft.

The foregoing in its application to prehistoric implements is, to a certain extent, theoretical, for their shafts or handles were of wood and by lapse of time have decayed and are lost. We know this as a matter of fact. Among the hundreds of collectors throughout the United States, where tens of thousands of ancient arrowpoints and spearheads have been collected, we have no record of any of them having been found with handle or shaft attached. This is not strange nor is it peculiar to these implements. The polished stone hatchets doubtless had wooden handles, yet of all of the thousands found, there have been less than a dozen reported in the United States with their wooden handles.[1] Like the arrowpoint or spearhead, it is usual to find them without any trace of a handle. Objects of wood used in prehistoric times have rarely been found, and the instances thereof are usually confined to those either protected by water[2] or those in the sandy desert, where there was no moisture to cause decay.[3]

There are some of these implements with their handles which, being found under these favorable conditions, or belonging to modern savages, have been preserved for inspection. Col. P. H. Ray, in his investigations and collections among the Hupa Indians,[4] reported a number of leaf-shaped implements, which, if found alone, would have passed for spearheads, as have thousands of others of similar form collected throughout all that portion of the world occupied by prehistoric man. The implements found by Colonel Ray are now in the U. S. National Museum under Professor Mason's charge (Plate 41).

[1] Thomas Wilson, Prehistoric Art, frontispiece and pl. 31.

[2] Page 946, fig. 192.

[3] The Coptic tapestries were buried in the Egyptian sands in the first to seventh centuries A. D. They have been found in this century in fairly good condition.

[4] Smithsonian Report, 1886, p. 222.

The first series consists of eight specimens. The material is obsidian or chalcedony varying from dark-brown to a dull blue, with veins of blue throughout the brown. The blades vary from 4 to 5¾ inches in length, from 1⅜ to 2⅜ inches in width, and are from ⅜ to ½ inch thick. Handles of pine, from 4½ to 6¼ inches, were attached to all of them. Five of these were glued or gummed, three were lashed. Another of these blades, similar in all respects to the former, was obtained by Colonel Ray, but the wooden handle was replaced by a wrapping of otter skin. The blade is 7¼ by 1⅞ by ⅜ inches. Specimens of the foregoing are set forth in Plate 41, a reference to which will make the description clear. The smaller specimen in this plate represents a series of knives obtained by Maj. J. W. Powell from the Pai Utes. The latter is described and figured by Dr. Charles Rau,[1] who says:

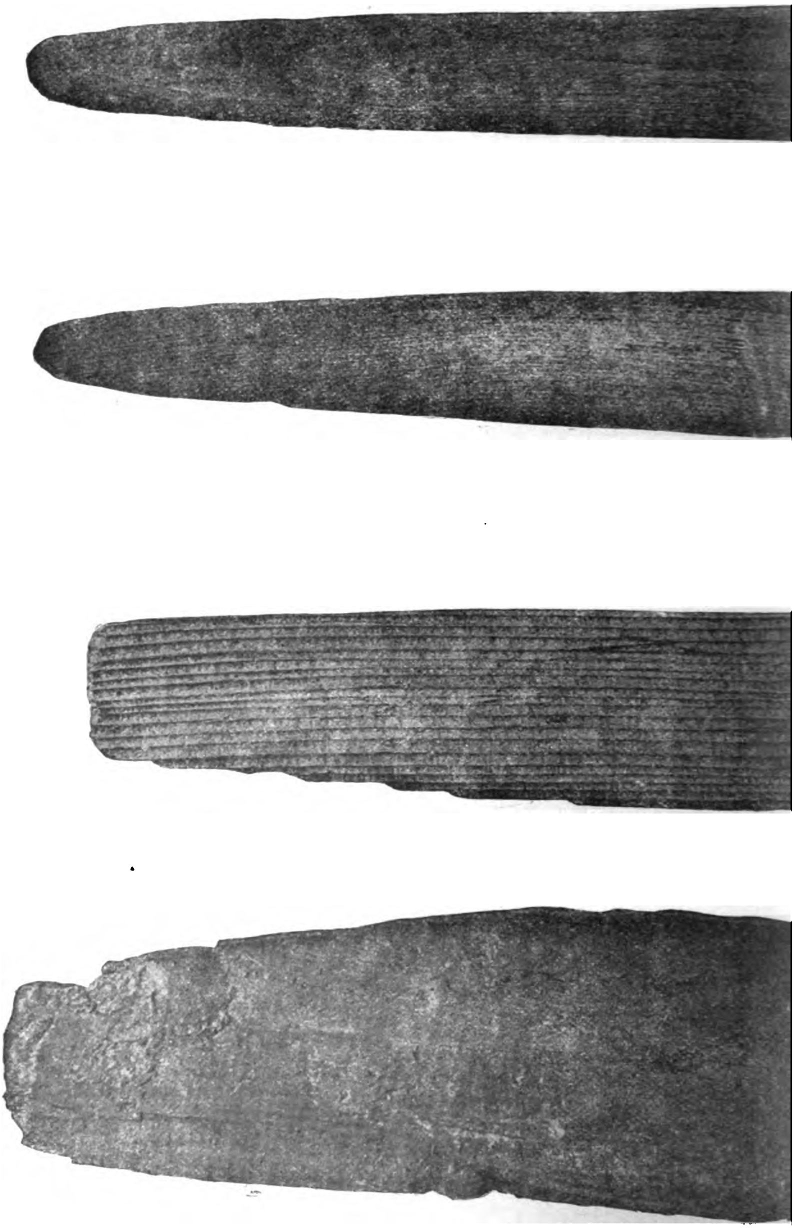
> Collectors are ready to class chipped-stone articles of certain forms occurring throughout the United States as arrow and lance heads, without thinking that many of these specimens may have been quite differently employed by the aborigines. Thus the Pai Utes of Southern Utah use to this day chipped-flint blades, identical in shape with those that are usually called arrow and spear points, as knives, fastening them in short wooden handles by means of a black substance. Quite a number of these hafted flint knives (fig. 1) have been deposited in the collection of the National Museum by Maj. J. W. Powell, who obtained them during his sojourn among the Pai Utes. The writer was informed by Major Powell that these people use their stone knives with great effect, especially in cutting leather. On the other hand, the stone-tipped arrows still made by various Indian tribes are mostly provided with small, slender points, generally less than an inch in length, and seldom exceeding an inch and a half, as exemplified by many specimens of modern arrows in the Smithsonian collection. If these facts be deemed conclusive, it would follow that the real Indian arrowhead was comparatively small, and that the larger specimens classed as arrowheads, and not a few of the so-called spear points, were originally set in handles and were used as knives and daggers. In many cases it is impossible to determine the real character of small leaf shaped or triangular objects of chipped flint, which may have served as arrowheads or either as scrapers or cutting tools, in which the convex or straight base formed the working edge. Certain chipped spearhead-shaped specimens with a sharp, straight, or slightly convex base may have been cutting implements or chisels. Arrowheads of a slender elongated form pass over almost imperceptibly into perforators, insomuch that it is often impossible to make a distinction between them.

Another series of similar implements (Plate 42) with handle attached are in the U. S. National Museum. They are from southern California, and are reported in Wheeler's Geographical Survey.[2] These specimens were collected by Mr. Shumacher from Santa Barbara and Santa Cruz islands. The material, while differing much, was uniformly of hard stone, such as flint, chalcedony, or jasper. The blades are inserted in redwood handles, fastened with gum or bitumen, and bear the evidence of long exposure. The dryness of the country whence they came was probably the cause of their preservation.

These wooden-handled knives were not confined to the coast nor,

[1] Archæological Collection of the U. S. National Museum, p. 2, fig. 1.

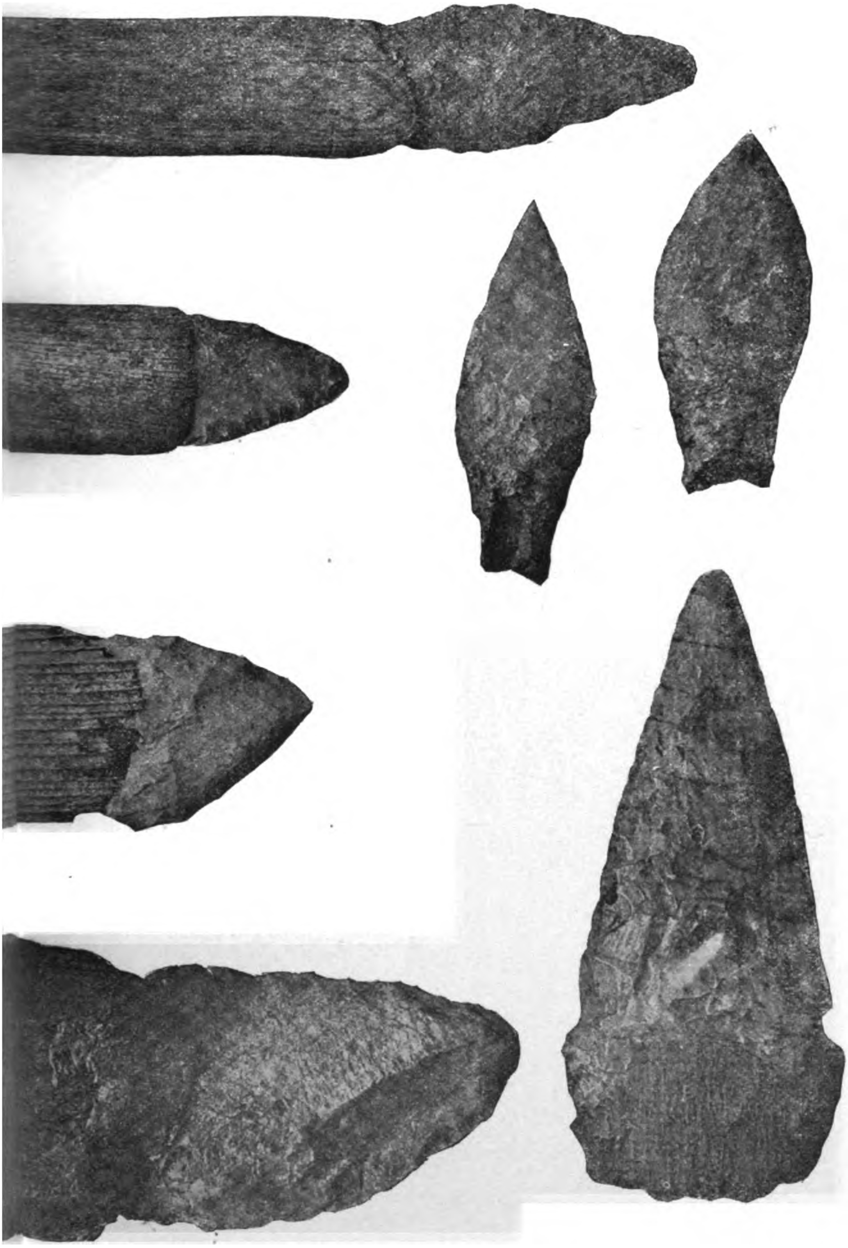
[2] George M. Wheeler, United States Geographical Surveys West of the 100th Meridian, VII, 1879, Archæology, p. 59.



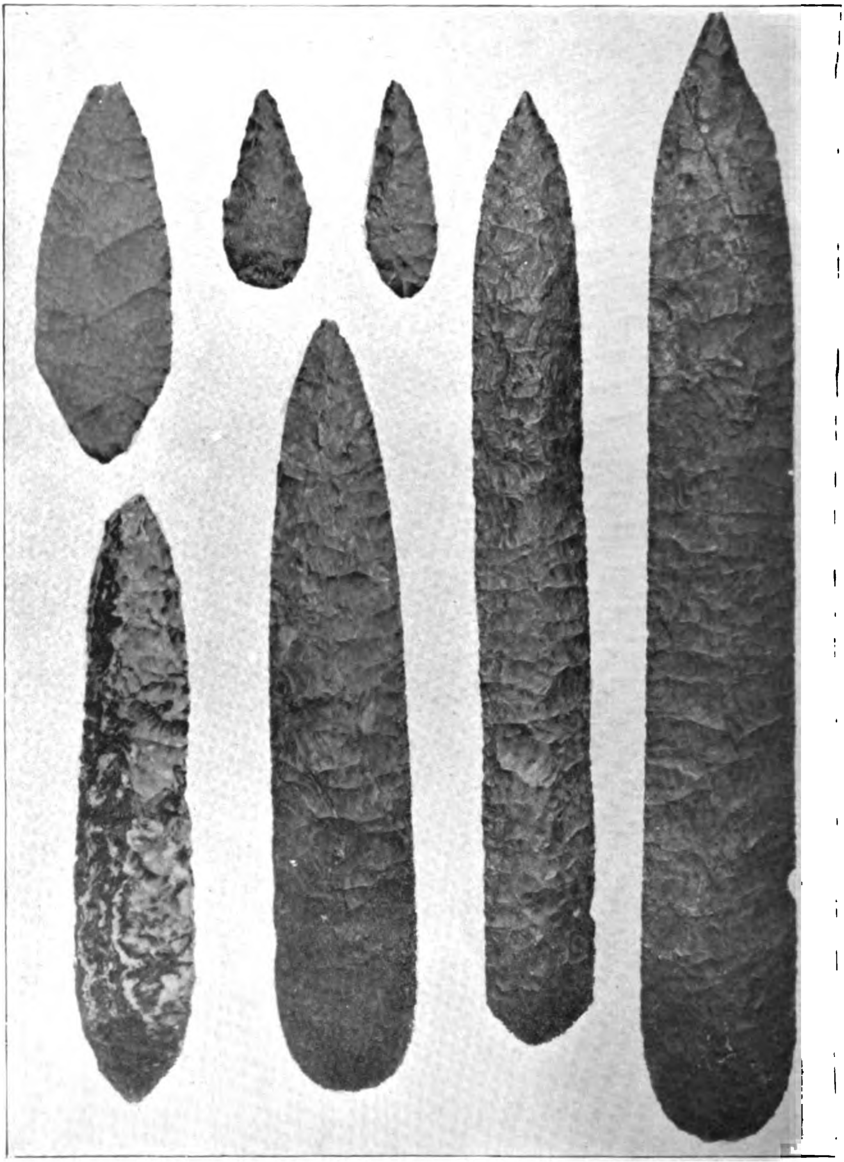
LEAF-SHAPED FLINT BLADES, IN WOC

Santa Barbara and Sar

Wheeler's Survey



WOODEN HANDLES, FASTENED WITH BITUMEN.
Santa Cruz islands, California.
...etc., VII, p. 59, pl. IV.



LEAF-SHAPED BLADES OF FLINT AND CHALCEDONY, SHOWING BITUMEN HANDLE FASTENING.

California.

Wheeler's Survey, etc., VII, pl. 1.

indeed, to California, but were found far in the interior. The Hazzard collection from the cliff ruins of Arizona and New Mexico, now in the Archæological Museum of the University of Pennsylvania, which made such a memorable display at the World's Columbian Exposition in Chicago, contains a series of similar knives of flint inserted in wooden handles from 4 to 6 inches in length, of the same style and kind as the California specimens in Plate 42.

Forming part of the same series are eleven other specimens without handles, but with the traces of bitumen on the base showing where a handle had been attached. It should not be forgotten in considering these implements that they come from a country which abounds in the ordinary arrowpoints and spearheads of all kinds and sizes, some of which show extremely fine chipping.

There is still another series[1] (Plate 43) quite different in form and make, but to which the same remark applies. Some of them represent the highest order of flint chipping. They form Class C of the division of leaf-shaped implements of the author's classification. They are long, thin, and narrow, with a well-wrought base which may be square, convex, or concave, while the point is sharp and symmetrical. The peculiarity which determined their classification was the parallelism of their edges throughout their length. An inspection of the specimens renders it evident that they were never intended as arrowpoints or spearheads. Their extreme thinness, together with the breakable character of the flint of which they are made, would cause them to break in any shock that might be given by throwing, lancing, or shooting. Those of the series with convex bases are covered with asphaltum or bitumen for 1 or 1½ inches of the base. This is evidence of their insertion in a handle, which, in view of the circumstances, and their association with the former specimens, we can only conclude was short, and that the implement was intended to be held in the hand and used as a knife or dagger.

Flint or chert points similar in every way to arrowpoints, and inserted in short antler handles, were found by Prof. F. W. Putnam and Dr. C. L. Metz, in their excavations of the Mariott mound in the Little Miami Valley, Ohio.[2] Ten or a dozen of these knife handles were found, in one of which was inserted a bone instead of a stone blade.

In the Swiss lake dwellings small polished stone hatchets or chisels are frequently found inserted in short antler handles. Many of these antlers were tenoned for insertion in a heavy wooden handle, evidently for use in chopping, as an ax,[3] but many of the antler handles were without tenons, and were evidently intended to be held in the hand and used as knives or chisels and not as axes.[4]

Flint or chert arrowpoints, inserted in short wooden handles for use as knives, are found in the ancient tombs of Peru. Sharpened and barbed

[1] George M. Wheeler, United States Geographical Surveys West of the 100th Meridian, VII, 1879, Archæology, pl. I.

[2] Eighteenth and Nineteenth Annual Reports of the Peabody Museum, 1886, p. 457.

[3] De Mortillet, Musée Préhistorique, pl. XLVIII.

[4] Idem., pl. LII, fig. 487.

points of bone and of ivory, inserted in short handles of wood, bone, and ivory, the lower end pointed for insertion in a lance shaft for use as harpoons, are in common use among the modern Eskimos. This short handle can be detached, thus making, if need be, a knife of the implement.

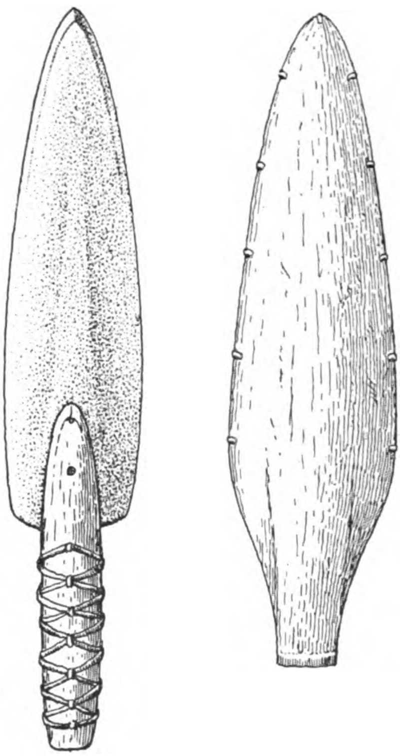


Fig. 193.

ESKIMO KNIFE WITH NEPHRITE BLADE, IVORY HANDLE, AND WOODEN SHEATH.

Norton Bay, Alaska.

Blade, 8½ x 2¼ inches.

E. W. Nelson. Cat. No. 176072, U.S.N.M.

An illustration of large blades, more or less leaf-shaped, and which, if alone, would be taken for spearheads, is shown in fig. 193, where such an implement of nephrite, beautifully wrought and finely polished, is inserted in a short handle, evidently for use as a knife. The illustrations, shown in Plate 44, of Eskimo specimens from Hotham Inlet, Alaska, collected by Lieut. Commander G. M. Stoney, U. S. N., are still more pertinent. Figs. 1 and 2 have blades of chert or hornstone of the usual leaf shape. Fig. 2 is handled for use as a knife by being inserted edgewise in a handle of wood. Fig. 1 is interesting, for its leaf-shaped characteristics are more easily identified, while its handle, instead of being of wood or fastened with bitumen or asphaltum, as have been nearly all others, is made of osier wrapped back and forth over a part of the upper edge of the blade, catching upon the irregularities of the flint edge and drawn tight so as to be held firmly in place. This was used as a fish knife, its interstices being yet filled with fish scales. Dr. Mason,[1] describing this instrument, says:

> There are thousands of pieces of shale, slate, quartzite, and other stones in the National Museum, which correspond exactly with the blades of the Eskimo woman's knife. These have been gathered from village sites, shell heaps, the surface of the soil, from graves, mounds, and Indian camps in countless numbers. * * * In the matter of attaching the blade to the handle or grip the Eskimo's mother-wit has not deserted her. Many of the blades are tightly fitted into a socket or groove of the handle. Boas, who lived among the Cumberland Gulf Eskimos, tells us that glue is made of a mixture of seal's blood, a kind of clay, and dog's hair. (Report of the Bureau of Ethnology, VI, p. 526.)

[1] The Ulu, or Woman's Knife, of the Eskimo. Report U. S. National Museum, 1890, pp. 411–417.

EXPLANATION OF PLATE 44.

Fig. 1. WOMAN'S KNIFE (Ulu). Blade of hornstone, leaf-shaped, with a projection from one margin. The handle is of the most primitive character, being formed of osier, wrapped backward and forward longitudinally, and held firmly in place by cross twining and weaving of the same material. The interstices are filled with fish scales. Length, 3¾ inches.

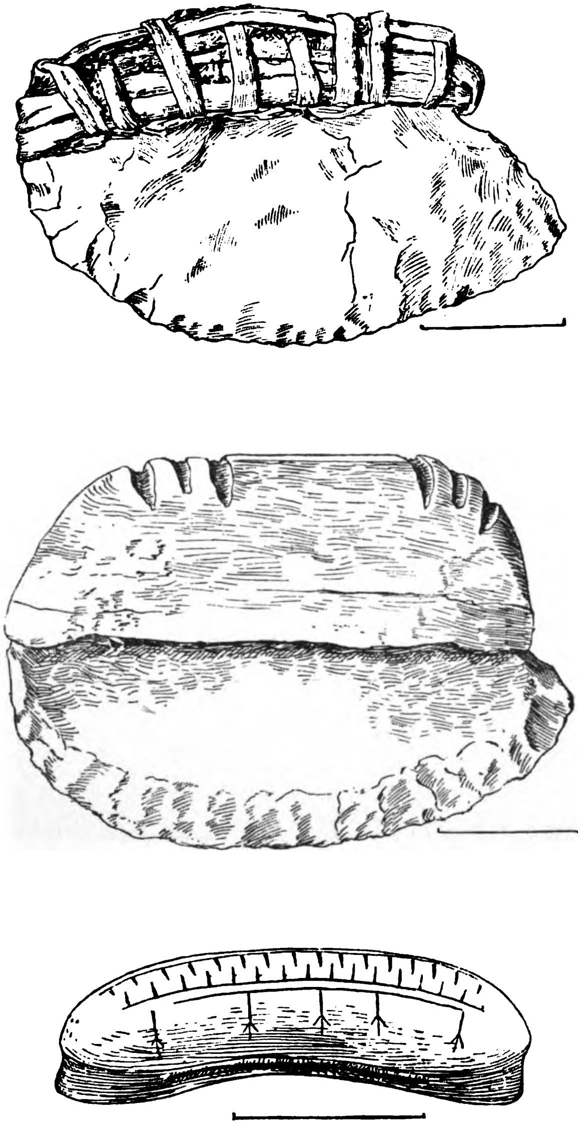
(Cat. No. 63765, U.S.N.M. Eskimo of Hotham Inlet, Alaska. Collected by Lieut. G M. Stoney, U. S. N.)

Fig. 2. WOMAN'S KNIFE (Ulu). Blade of chert or flint material, inserted in a handle of wood. On the upper margin of the latter at either corner are three cross gashes or grooves.

(Cat. No. 63766, U.S.N.M. Eskimo of Hotham Inlet, Alaska. Collected by Lieut. G. M. Stoney, U. S. N.)

Fig. 3. WOMAN'S KNIFE (Ulu). Handle of walrus ivory. Ornament, groove, and herringbone on top; lines and alternating tooth-shaped cuts on the side, with five scratches resembling inverted trees. Pocket groove for blade, abruptly wedge-shaped, like the kernel of a Brazil nut. Length, 2¼ inches.

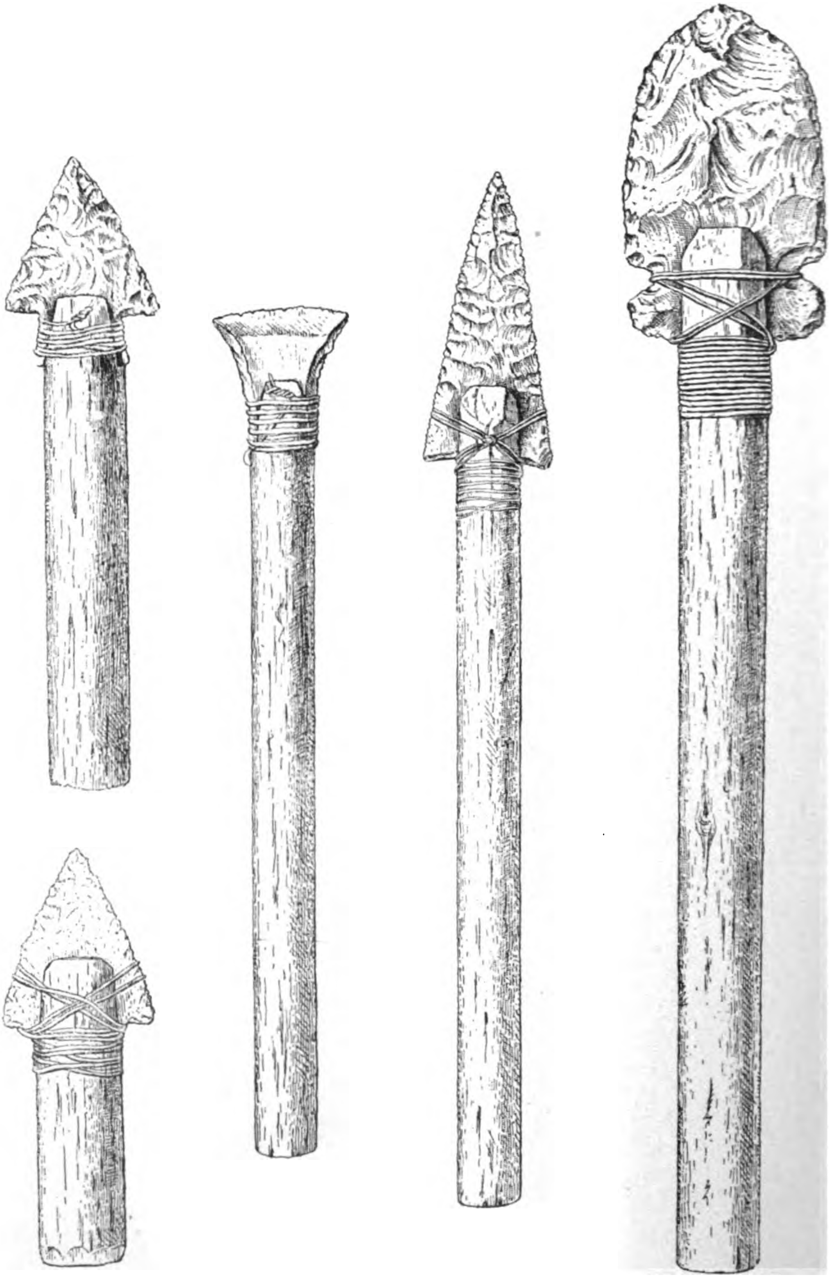
(Cat. No. 44598, U.S.N.M. Eskimo of Cape Nome, Alaska, 1880. Collected by E. W. Nelson.)



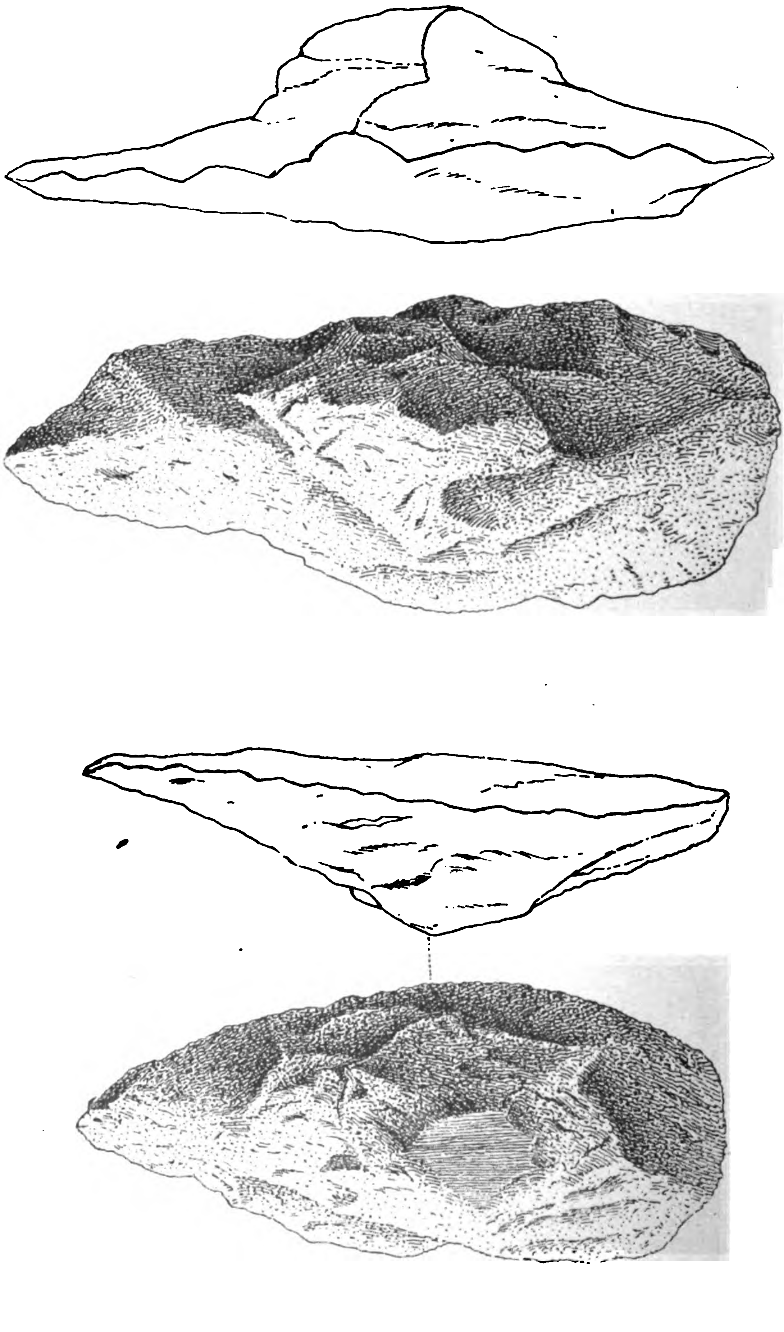
ULU OR WOMAN'S KNIFE.

Hotham Inlet and Cape Nome.

Mason, Report U. S. National Museum, 1890, pl. LXI.



COMMON ARROWPOINTS, HANDLED BY THE AUTHOR TO SHOW THEIR POSSIBLE USE AS KNIVES.
U. S. National Museum.

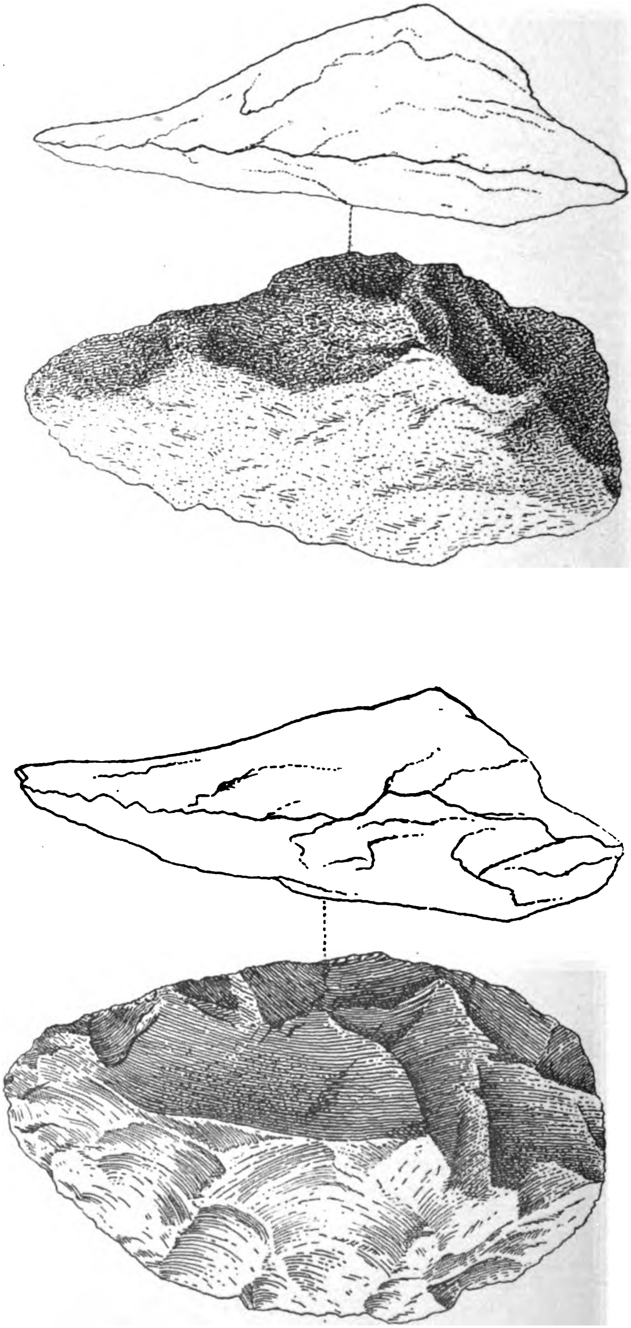


HUMPBACKED KNIVES.

Side and edge views.

District of Columbia, United States, and Somaliland, Africa.

Cat. Nos. 185000, 105808, U.S.N.M.



HUMPBACKED KNIVES.
Side and edge views.
United States.
Cat. Nos. 171487, 1073, U.S.N.M.

Fig. 3 in this plate represents a handle for a similar blade, which is, however, missing. It is made of walrus ivory, the groove in which the blade has been inserted being plainly seen.

Fig. 194 represents one of the thin leaf-shaped blades from Wyoming. It is of agatized wood, is very thin, and has been finely chipped. One edge is more convex than the other and is much the sharper. Compared with the Ulu knife (Plate 44, fig. 1), no reason appears why a similar handle would not make it the same knife.

Plate 45 shows a series of common arrow or spear heads which have been inserted and wired in handles by the author. The handles vary from 6 inches in length down. They are intended to illustrate the proposition which has been herein presented—that with long handles they are arrows, with longer handles they become spears, while with short handles they become knives, and the distinction is only recognizable by the handle.

Fig. 194.
LEAF-SHAPED BLADE OF AGATIZED WOOD.
Wyoming.
Natural size.

No attempt has been made in the foregoing arguments to show a difference, except in the handle, of the implement used as a spear or arrow and its use as a knife. The announcement is made as a working hypothesis that the average stone arrowpoint or spearhead collected throughout the country as an Indian implement or weapon may have been either spear, javelin, arrow, or knife, dependent upon the kind of handle employed.

There are other implements of the same material and manufacture, but with variations of form, which are not, and were never intended to be, arrow or spear heads. These, when viewed in profile from either the side or edge, show that they could not have served as piercing implements or weapons. Their edges are on the sides and not at the points, and they could only have been used for cutting and not for piercing, and were, therefore, knives. Plates 46 and 47 present specimens of this class. They are here presented in side and edge views to show this peculiarity, for viewed from the side only they appear as ordinary leaf-shaped implements worked all round to an edge. The points are not sharp, and it is doubtful if they could ever pierce any resisting substance, projected with whatever force. The impossibility

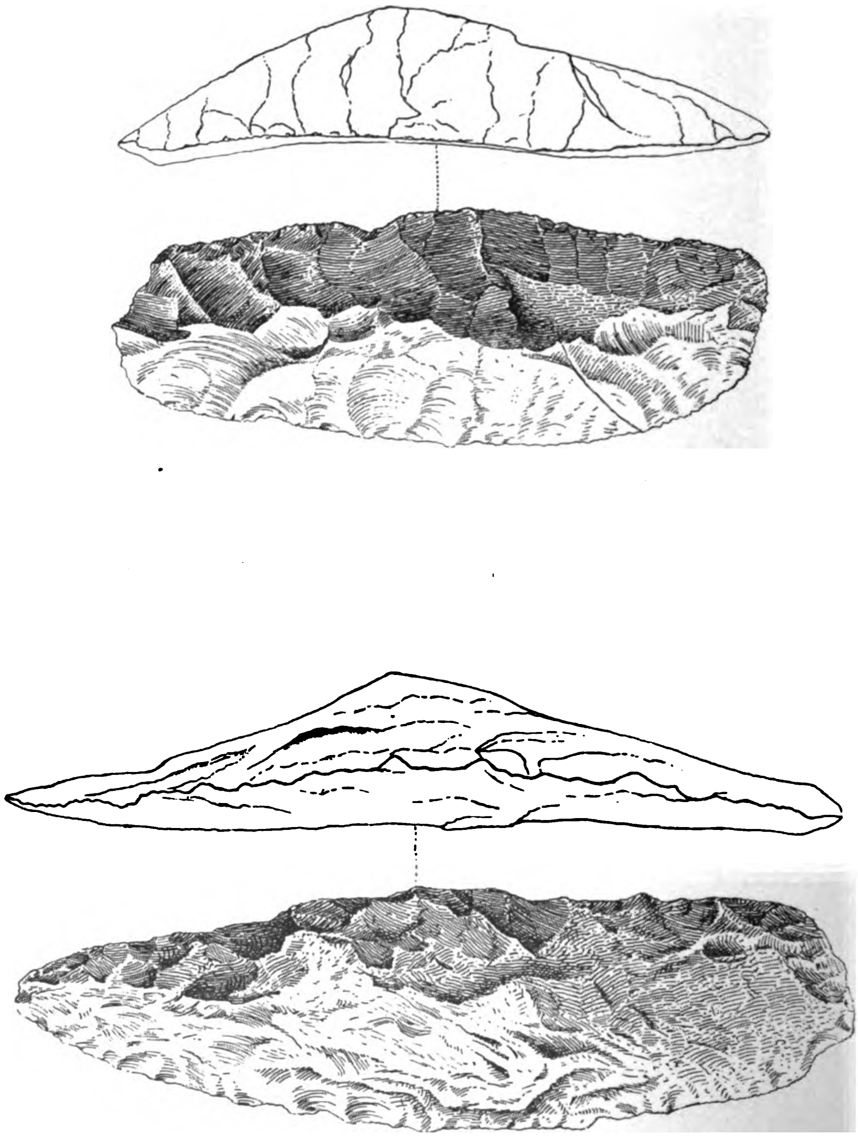
of their use in this manner becomes more apparent when the edge view is considered. This shows the want of symmetry in the implement and completely changes the idea presented by the side view. There is on the top, if one may so call it, a decided hump, and, for want of a better name, these implements have been called "humpbacked." One of them is the chalcedonic flint, while the other three are quartzite. They are rude and have all been made by chipping. Each implement has only one rounded edge sharp enough for use, and could be used when held in the hand after the manner of the fish knife (Plate 44, fig. 1).

The manner of holding these humpbacked implements for use is shown in Plate 48, where two of them are held in the hand so as to present the cutting edge. This (in Plate 48) leads to another hypothesis, that is, that these implements were used ambidextrously, and furnish evidence of right- and left-handedness on the part of prehistoric man. It is certain that the shape of an occasional implement fits the left hand better than it does the right. Certain specimens show this more or less plainly. Their humps are not in the center but off to one side, sometimes to the right, other times to the left, while the experiment of grasping them in the hand (as shown in Plate 48) demonstrates that they are more easily manipulated and more effective when used right and left handed respectively, than when used indifferently.

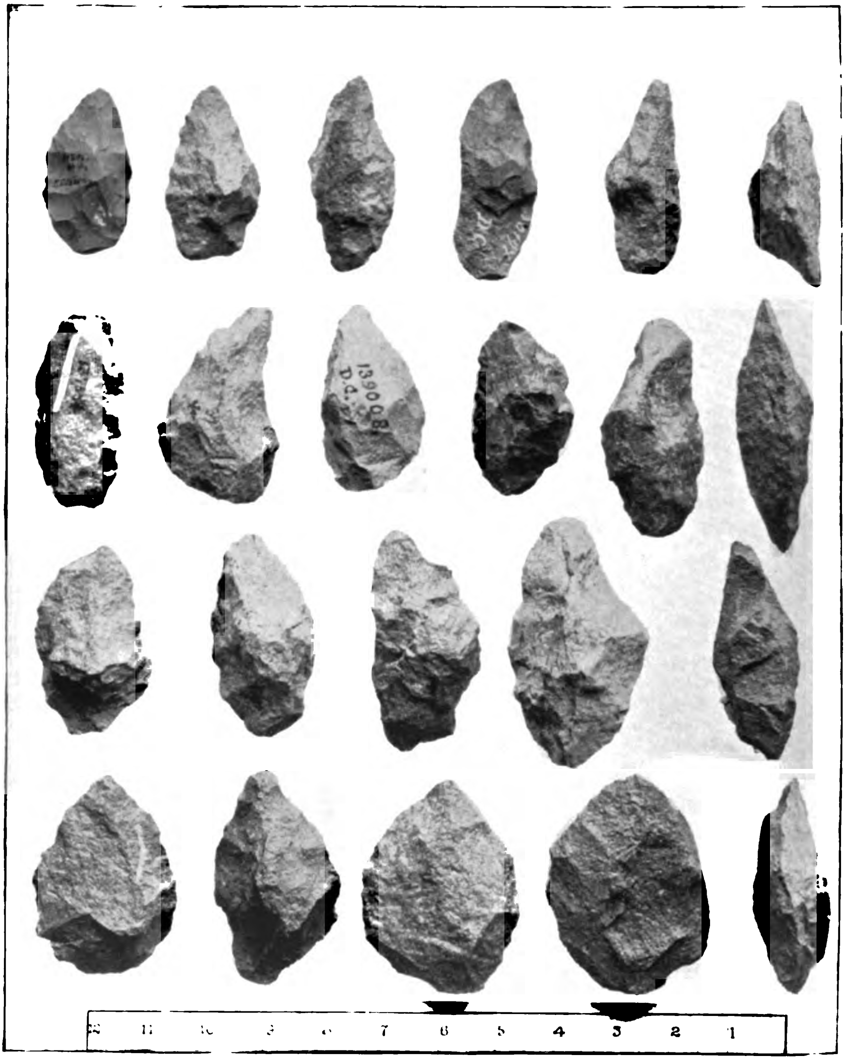
It has been suggested that these implements were only accidents or failures made by the aboriginal workmen when endeavoring to make the usual leaf-shaped implement, but such is not regarded as a correct deduction.

It would be foolish to assert that there were no accidents or failures in the prehistoric quarry or workshop. The author has shown in Plate 63, the chips and débris which he personally took from Flint Ridge, Ohio. Anyone having the slightest familiarity with such work has seen and will recognize thousands of such specimens. At Piney Branch, District of Columbia, they were to be numbered by the hundreds of thousands and to be measured by the ton. But it is equally daring to assert that everything found was an accident or failure, and that implements with the specialization of these now under discussion were but waste, the débris and rejects of the workshops and the accidents or failures of the workmen. Their number is too large, their dissemination too general, their distribution too extensive, and their specialization and adaptability too evident to permit such a conclusion to pass unchallenged. The evident existence of an intentional cutting edge around one side of the oval can not be ignored, while their fitness to either hand, as shown in Plate 48, and their adaptability for use as knives or for cutting purposes, are evidences against the reject or waste theory that can not be set aside by mere declarations, however persistently or pertinaciously made. No reason is, or, I take it, can be given why the workman, having gotten his implement into its present humpbacked condition, should not have continued his work by striking off

MANNER OF HOLDING "HUMPBACKS" FOR USE AS KNIVES.



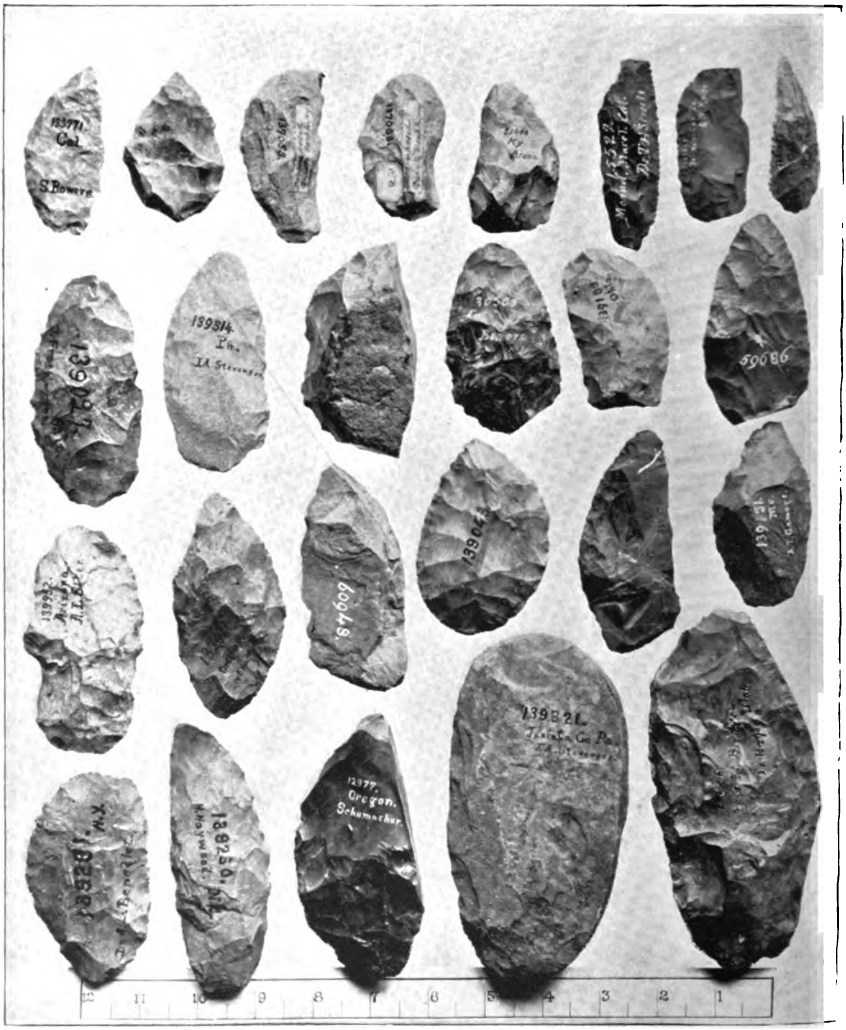
"HUMPBACKS" CHIPPED SMOOTH, SHOWING INTENTIONAL KNIVES.
United States.
Cat. Nos. 189985, 171487, U.S.N.M.



"HUMPBACKS" OF QUARTZITE WITH ONE CUTTING EDGE, USED AS KNIVES.

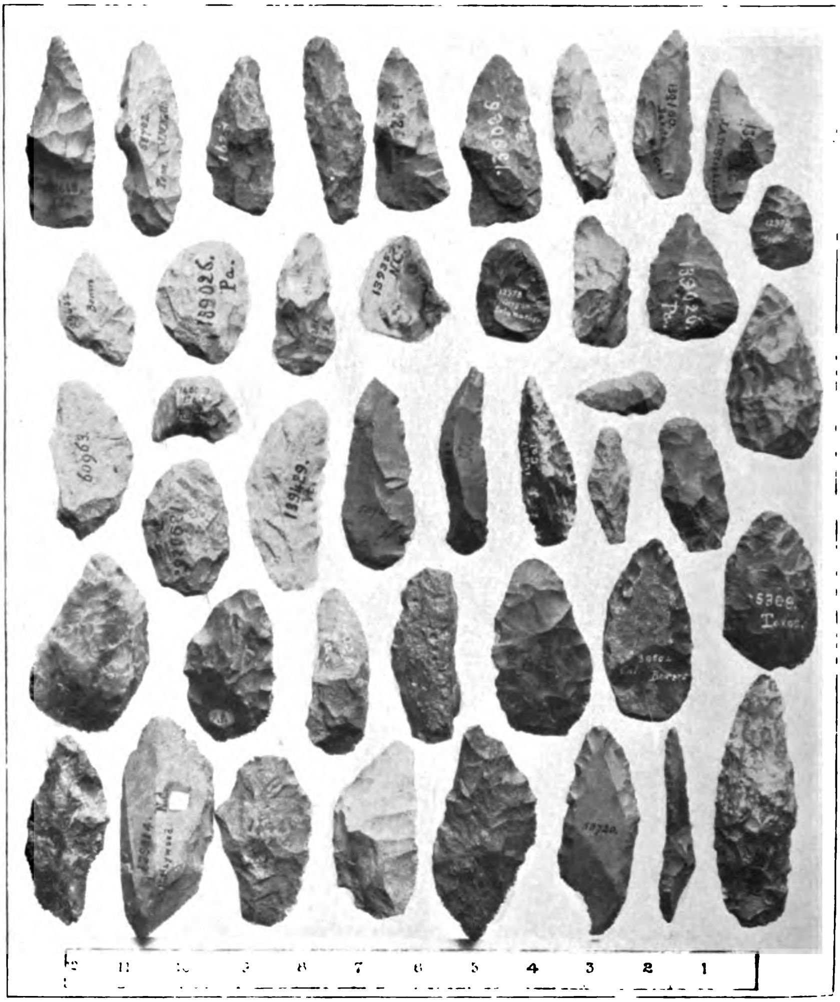
United States.

Cat. No. 139008, U.S.N.M.



RUDE KNIVES OF FLINT AND HARD STONE, CHIPPED TO A CUTTING EDGE ON ONE SIDE OF THE OVAL.

United States.



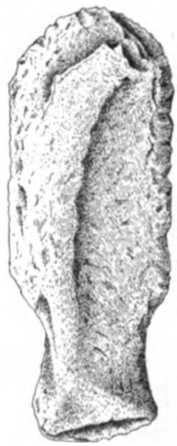
RUDE KNIVES OF FLINT, JASPER, ETC.

Some in flakes, chipped to a cutting edge on side of oval; some have a well-developed hump.

United States.

1

2



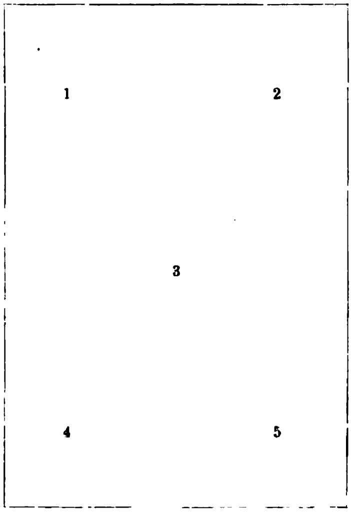
3

4

5

KNIVES WITH STEMS, SHOULDERS, AND BARBS, RESEMBLING ARROWPOINTS AND SPEARHEADS, BUT WITH ROUNDED POINTS UNSUITABLE FOR PIERCING.

EXPLANATION OF PLATE 53.



KNIVES WITH ROUND POINTS.

Fig. 1. WHITE FLINT.
(Cat. No. 19022, U.S.N.M. Indiana.)

Fig. 2. FLINT.
(Cat. No. 10004, U.S.N.M. Camden County, Georgia. Chas. R. Floyd.)

Fig. 3. QUARTZITE.
(Cat. No. 18050, U.S.N.M. Edgartown, Massachusetts. J. W. Clark.)

Fig. 4. PYROMACHIC FLINT.
(Cat. No. 34341, U.S.N.M. Frankford, Ohio. A. R. Crittenden.)

Fig. 5. BROWN CHERT.
(Cat. No. 3210, U.S.N.M. Mound near Nashville, Tennessee. Maj. J. W. Powell.)

the hump if he desired it to be stricken off, either with a direct stroke of the hammer or by the mediation of a punch, thus reducing its thickness and making it the usual leaf-shaped implement. The conclusion seems inevitable that his failure to do this is evidence of the want of his desire to do so, and that he left it thus—specimens being found throughout the country—is evidence that he desired to make a different implement from the leaf-shaped. This different implement was for cutting and not for piercing, was to be held in the hand and not used as a projectile, and finally is a knife and not an arrowpoint or spearhead.

Detailed examination confirms the view that these implements were intentionally manufactured and were not mere accidents or failures. Plate 49 represents two of these humpbacked implements, side and edge views. From these it is evident that the making of the hump is intentional. Not only is the hump recognized and permitted, but it has been adopted and treated accordingly. It has not here been left rude or unseemly, but has been carefully smoothed by chipping over its entire surface, the hump being as well preserved as in the rudest specimens. The specimens in this plate are both of flint, one from Wisconsin, the other from Georgia; both are flat on the bottom, rounded on top, and brought by chipping to a sharp cutting edge and without point. If these two specimens were the only ones thus treated, their evidence would be insufficient, but the Museum possesses numerous examples of the same kind which tend to prove the same fact. Plates 50 to 52 present some of these specimens, and a comparison will show the similarity. Their number shows that those in Plate 49 are not isolated specimens, while their number and extensive distribution throughout the country demonstrates their common use as one of the tools or implements belonging to the prehistoric culture of the country. These plates are intended also as evidence of the major proposition—that is, that many of the flint and other objects heretofore classed as arrowpoints or spearheads were really knives. These implements have no sharp points and could never have served for any piercing or thrusting purpose, but, on the other hand, have been made sharp on one, rarely on both edges, and could have been used only for cutting. The cutting edge is usually convex; the outer edge or back is thick and heavy. It has not been worked, and must be held in the hand to be used saw or knife fashion. It is submitted that they show themselves to have been cutting implements used after the manner of knives, and not to have been either arrowpoints or spearheads.

The major proposition of this chapter is that many aboriginal implements having the appearance of arrowpoints or spearheads, and heretofore generally so classed, were not such, but were in reality knives intended for cutting or sawing purposes. The specimens on Plate 53 are evidence in favor of this. The lower or butt end of these specimens has a stem, with base, notches, shoulders, barbs, sharp edges, etc., and in all these regards they resemble the ordinary arrowpoint

or spearhead. The point, however, while symmetrically formed and thoroughly worked, is not sharp, but is a well-rounded oval, impossible for thrusting or piercing.

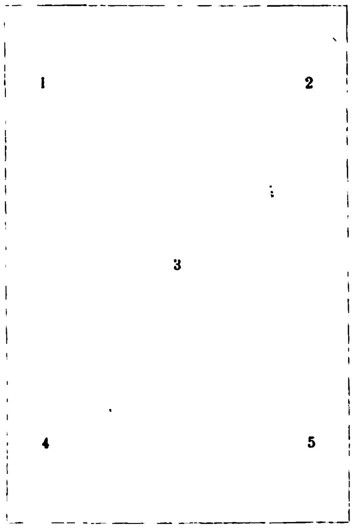
On page 941 of the classification of arrowpoints and spearheads, among peculiar forms, a certain series is shown as Class H, asymmetric. These are there mentioned as being possible knives, and were inserted to complete the classification. No opportunity then offered to investigate their true character or to bring out their peculiarities. Plates 54 and 55 and fig. 195 are here introduced in continuation of that investigation. The original of fig. 195 belongs to the collection of Dr. Roland Steiner. There are 122 specimens of this series which are represented by fig. 195 and certain specimens on Plate 55. They resemble arrowpoints and spearheads, having the same stem, base, shoulders, and barbs. So far as relates to the stem end, their resemblance is perfect, and they might belong to any class of stemmed arrowpoints or spearheads. Some are rather thick and rude, but many are thin and finely chipped. Their peculiarity is their asymmetric form. They are lopsided, or one-sided. The shoulder or barb is on only one edge. The other has been chipped off in the ruder specimens from one side only, making a concave scraping edge, possibly for arrow shafts, while the finer ones are chipped from both sides and are not concave; but in both kinds of specimens the shoulder or barb is on one side only, and that has been brought to a smooth, sharp edge. An examination of these specimens, a number of which are shown in Plates 54 and 55, shows clearly their asymmetric character and makes apparent at a glance their knife-like appearance. A short handle attached with sinew, as in the case of ordinary arrowpoints or spear heads (Plate 45), or with gum or bitumen, as in the California specimens (Plates 41-43), will make a knife suitable for all known savage needs.

Fig. 195.
UNILATERAL KNIFE OF YELLOW FLINT.
Georgia.
Steiner collection. Cat. No. 171459, U.S.N.M.

All differentiation rendering them suitable for knives renders them unsuitable for arrowpoints or spearheads. They are heavier on one side than on the other, which renders them lopsided and would throw them out of the line of flight and destroy their efficacy as projectiles. It is believed that even a slight examination demonstrates the correctness of the conclusion that they were knives, rather than arrowpoints or spearheads.

Concluding the chapter on knives, it is deemed wise to introduce for comparison a series of those which heretofore passed for and have been recognized as knives. The author does not remember any specimens of the asymmetric or unilateral form in Europe, except those from Solutré which do not belong to the Neolithic period. Knives were, however, by no means rare among the prehistoric implements of that

EXPLANATION OF PLATE 54.



UNILATERAL KNIVES.

Fig. 1. YELLOW FLINT.
(Cat. No. 10824, U.S.N.M. Bahala Creek, Copiah County, Mississippi. T. J. R. Keenan.)

Fig. 2. BROWN CHERT.
(Cat. No. 60597, U.S.N.M. Lincoln County (?), Tennessee. C. S. Grisby.)

Fig. 3. CHERT.
(Cat. No. 34863, U.S.N.M. Falmouth Island, in Susquehanna River, Pennsylvania J. Orendorf and F. G. Gailbraith.)

Fig. 4. DARK-GRAY FLINT.
(Cat. No. 7672, U.S.N.M. Groveport, Ohio. W. R. Limpert.)

Fig. 5. MOTTLED-GRAY FLINT.
(Cat. No. 23265, U.S.N.M. Mound on Etowah River, Georgia. B. W. Gideon.)

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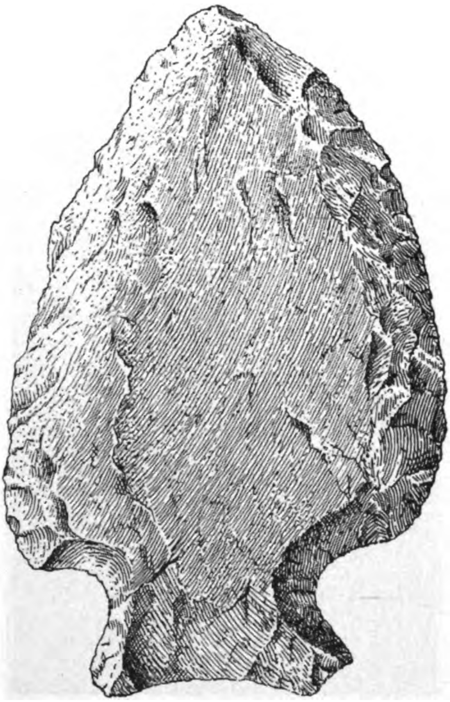

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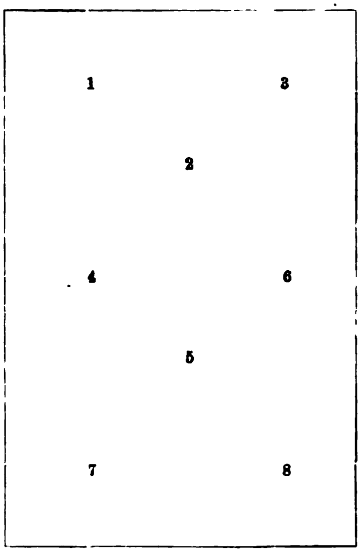
UNILATERAL KNIVES.

EXPLANATION OF PLATE 55.



UNILATERAL KNIVES.

Fig. 1. BROWN JASPER.
(Cat. No. 31583, U.S.N.M. (Locality unknown.) Dr. T. H. Bean.)

Fig. 2. PALE-GRAY FLINT.
(Cat. No. 32753. U.S.N.M. Richmond, Jefferson County, Ohio. Samuel Houston.)

Fig. 3. PINK FLINT.
(Cat. No. 171459, U.S.N.M. Burke County, Georgia. Dr. R. Steiner.)

Fig. 4. GRAY FLINT.
(Cat. No. 62104, U.S.N.M. Mason County, West Virginia. R. W. Mercer.)

Fig 5. FLINT.
(Cat. No. 30179, U.S.N.M. (cast). Illinois. Dr. J. F. Snyder.)

Fig. 6. GRAY FLINT.
(Cat. No. 59221, U.S.N.M. Tennessee. C. L. Stratton.)

Fig. 7. WHITE FLINT.
(Cat. No. 196505, U.S.N.M. Louisiana. Phillips collection.)

Fig. 8. WHITE FLINT.
(Cat. No. 4935, U.S.N.M. Illinois.)

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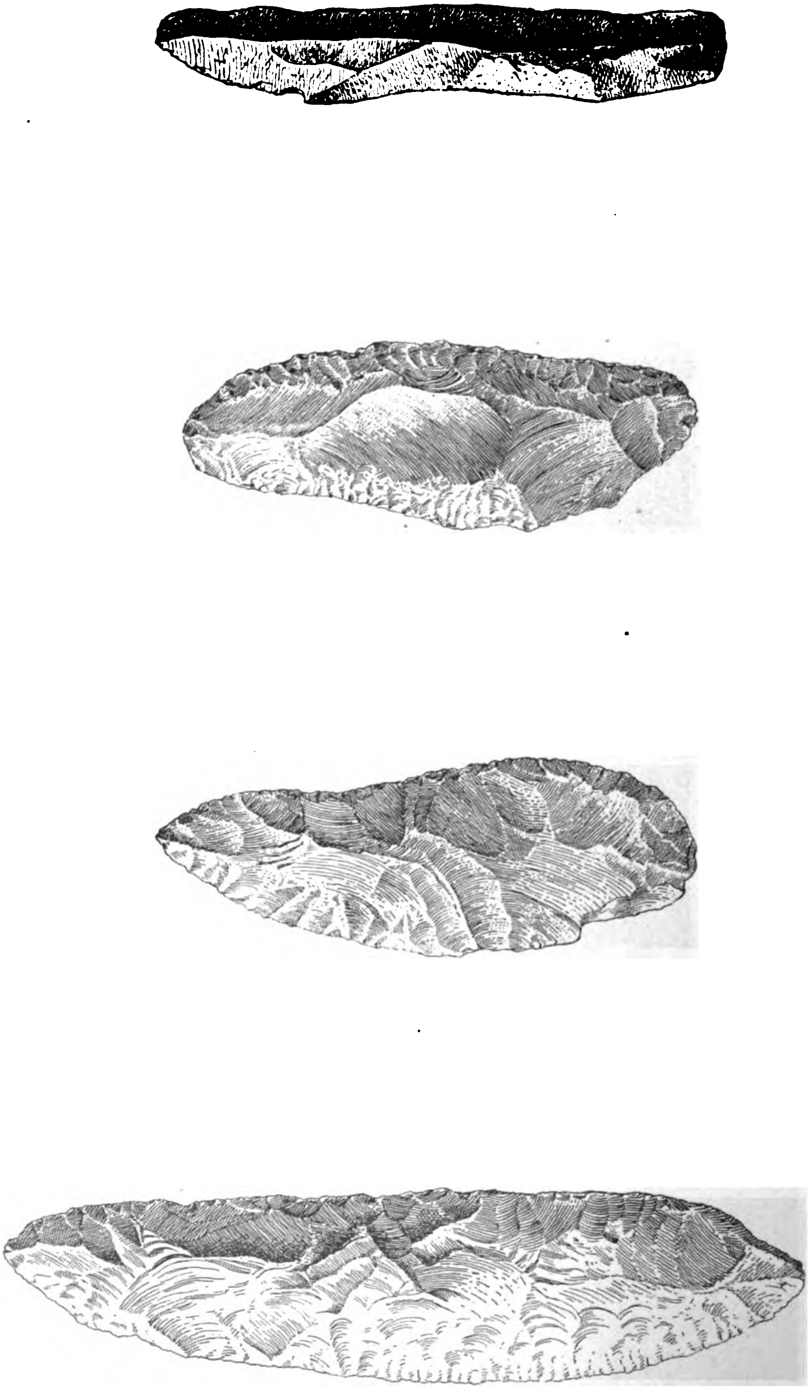
UNILATERAL KNIVES.



FLINT FLAKES CHIPPED ON ONE EDGE ONLY, INTENDED FOR KNIVES.

EXPLANATION OF PLATE 56.

1 2 3 4

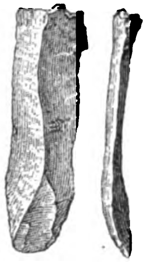
FLINT FLAKES CHIPPED ON ONE EDGE ONLY, INTENDED FOR KNIVES.

Fig. 1. FLINT.
(Cat. No. 27001, U.S.N.M. Cumberland Mountains, Tennessee. Gen. J. T. Wilder.)

Fig. 2. FLINT.
(Cat. No. 60265, U.S.N.M. Tennessee. C. S. Grigsby.)

Fig. 3. FLINT.
(Cat. No. 19234, U.S.N.M. Louisville, Kentucky. Dr. James Knapp.)

Fig. 4. FLINT.
(Cat. No. 100257, U.S.N.M. Spiennes, Belgium. Thomas Wilson.)



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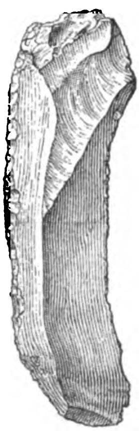

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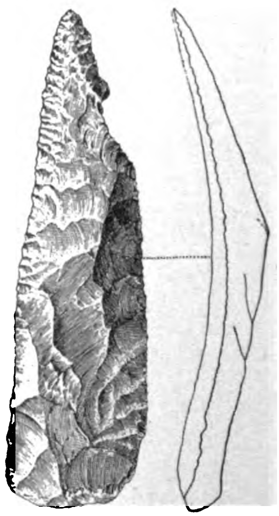
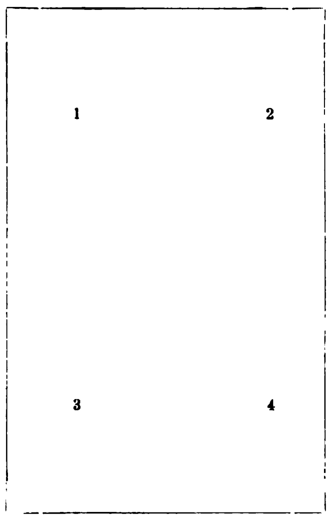


4

FLINT FLAKES CHIPPED ON ONE EDGE INTENDED FOR KNIVES.

EXPLANATION OF PLATE 57.



FLINT FLAKES CHIPPED ON ONE EDGE, INTENDED FOR KNIVES.

Fig. 1. GRAYISH FLINT.
(Cat. No. 29024, U.S.N.M. Milnersville, Guernsey County, Ohio.)

Fig. 2. GRAY JASPERY FLINT.
(Cat. No. 98089, U.S.N.M. Kentucky. W. M. Linney.)

Fig. 3. YELLOW JASPER.
(Cat. No. 7050, U.S.N.M. Union County, Kentucky. S. S. Lyon.)

Fig. 4. PALE-GRAY FLINT.
(Cat. No. 32421, U.S.N.M. Lick Creek, Orange County, Indiana. F. M. Symmes.)

country. One of these knives is represented in Plate 56, fig. 1. It is nothing more than a smooth flake struck from a nucleus of flint in such way as to make or leave a natural edge sharp for use. Specimens similar to this in appearance and manufacture, and supposed to have been made and used as knives, are found in great profusion throughout western Europe, almost every excavation in a prehistoric occupation bringing these flakes to light in greater or less number. The same statement can be made in respect to America. Plate 57, figs. 1, 2, are specimens of similar flint flakes from America, supposed to have been used as knives. Flakes of the same general character, but chipped to a sharp edge, are found in both Europe and America and are also supposed to have been used as knives. Whether they have been dulled by use and the edge then restored by chipping is unknown. It is known, however, that the worked flakes, either primarily or secondarily chipped to an edge, have been found in many of these places and that they are generally accredited as knives. The other specimens on Plates 56 and 57 are representatives of these worked flakes.

The subject of knives is not exhausted. It has not even been considered except as it involves arrowpoints or spearheads.

X. WOUNDS BY ARROWPOINTS OR SPEARHEADS.

The author of the Manuel du Chirurgien d'Armée declared that military surgery had its origin in the treatment of wounds inflicted by arrows and spears, and in proof thereof he quoted from ancient classics[1] and cited Chiron and Machaon's patients, Menelaus and Philoctetes, and Eurypyles treated by Patroclus. He believed the name "medicus" in the Greek anciently signified "sagitta," an arrow,[2] and declared that Hippocrates used a particular forceps, "belulcum," for extracting arrows, which his successor, Diocles, improved and called "graphiscos."[3] Heras of Cappadocia, in the wars of Augustus, invented the duck-bill forceps. Celsus[4] taught the necessity of dilating the wound in order to extract the arrowhead, and Paulus Ægineta[5] treated arrow wounds in a peculiarly successful manner.

The author, Baron Percy, who thus showed his knowledge of classic medical literature, supposed he had discovered the origin of surgery and was dealing with the earliest wounds made by man with the machinery of war.

The discovery in the present century, of prehistoric man, and the repeated findings of his graves and cemeteries belonging to the Neolithic and Bronze ages, and the thousands of skeletons therein, many of them with wounds and fractures—these things have completely over-

[1] Homer, Iliad, Book XI.
[2] Sextus, Advers. Math., Book 1, chap. 2.
[3] Andrea della Croce, Book 7, p. 173, Venice, 1574.
[4] De Medicina, Book VII, chap. V.
[5] De re Medica, Book VI, chap. 88.

turned the ideas of Baron Percy as to the earliest human wounds and the origin of surgery.

In an earlier chapter we have seen how the ages of stone and bronze had practically passed away without any historical mention of their existence. The beginning of history is subsequent to them. Nowhere in the Eastern Hemisphere, nor elsewhere except among modern savages, have stone arrowheads been known in historic times. Arrowpoints may have been used by the million in times of antiquity, but those known to history, noted by historians, were all of iron or bronze; none were of stone. In the army of Xerxes only one tribe, blacks from the interior of Africa, had arrows tipped with stone. All others used iron or bronze. The age of stone arrowpoints or spearheads had passed away before the time of Xerxes. All of which only shows how sadly mistaken was the author of the Manuel du Chirurgien d'Armée in his opinion as to the origin of surgery and the dates of the earliest wounds made by man's weapons.

It has been thought by many persons, among them a number highly qualified to judge, that there were no burials made during the Paleolithic period in western Europe. Whether this be true or not, it must be admitted that, either because of the rarity of the burials or the immensity of time which has elapsed, or possibly the failure to discover the graves, or for these reasons either singly or collectively, there have been comparatively few of the skeletal débris of Paleolithic man found. And this would satisfactorily account for the few examples of wounds found. The skeletons from the cave at Cro-Magnon show evidence of wounds. The femur of the man has been broken, while the forehead of the woman that lay beside him bears a large gash, made apparently with a flint hatchet.

Broca, who examined these specimens, is of the opinion that the latter bore traces of suppuration and evidences of healing.[1]

Dr. Hamy reports many of the bones in the cavern at Sordes as having curious wounds, one a gaping wound in the right parietal of a woman who, like that of Cro Magnon, must have survived the injury for some time. Pieces of bone had been removed and there was evidence of healing.[2]

There has been some question as to whether these caves belonged to the Paleolithic period. It makes but little difference to the present argument, for we will soon see that in the Neolithic period such wounds, made sometimes by hatchets or by blows of other weapons, and sometimes by thrusts received by arrows or spears, were found in considerable number.

Dr. Prunières, of Marvajols (Lozère), France, a surgeon, anatomist, and an early student of prehistoric anthropology, conducted many original excavations into the dolmens, tumuli, and burial places of his

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[1] Broca, Les Ossements des Eyzies, Paris, 1868.

[2] Lartet and Chaplain-Duparc, Une Sépulture des Anciens Troglodytes des Pyrénées.

neighborhood, and had the good fortune to make a large collection of objects pertaining to prehistoric man in that country. He took special care to search for and preserve all those relating to physical anthropology, especially those showing skeletal peculiarities. The following is a partial list of objects in his collection relating to arrow wounds:

The superior portion of a tibia, with a deep and suppurated wound, in which is still embedded a flint arrowpoint.

Fragment of the iliac bone, in the internal part of which is embedded an arrowpoint in a wound which showed signs of suppuration.

Another fragment of iliac bone, in the external part of which was embedded an arrowpoint of flint in a suppurated wound.

A dorsal vertebra with flint arrowpoint in a wound in the body of the vertebra—no suppuration.

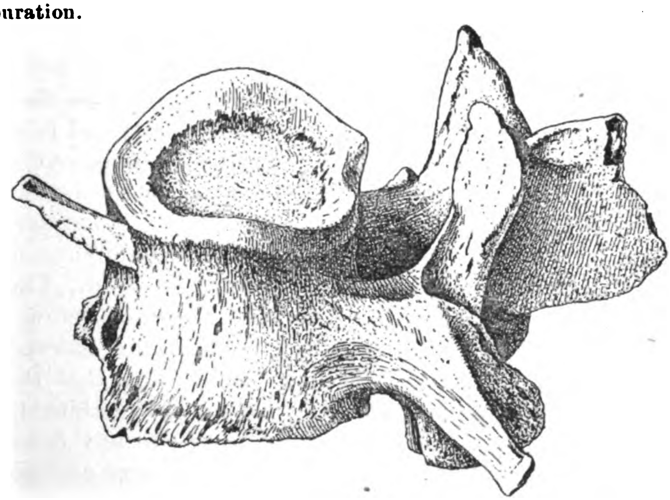


Fig. 196.

HUMAN VERTEBRA (PREHISTORIC) PIERCED WITH FLINT ARROWPOINT (TRANCHANT TRANSVERSAL).

Cartailhac, La France Prehistorique, p. 254, fig. 124.

Lumbar vertebra with a wound which had been much enlarged by suppuration and an arrowpoint embedded it it.

A vertebra with an arrowpoint buried in the body. (Presented before the Congress at La Rochelle.)

A vertebra with an arrowpoint buried in the wound.

An astragalus with arrowpoint in the wound.

The caverns of Baumes-Chaudes and L'Homme Mort were the most complete charnel houses of Neolithic times, each containing about three hundred skeletons capable of identification. It was out of this wealth of material that Dr. Prunières was able to obtain such numbers of peculiar specimens.

The prehistoric anthropologists of France have always realized the importance of examining and preserving the pathologic or traumatic specimens, and so De Mortillet, Cartailhac, Nadaillac, De Baye, and others have reported many specimens bearing evidence of arrow wounds.

Fig. 196 represents a human vertebra pierced by an arrowpoint,

tranchant transversal, from the cavern of Pierre-Michelot (Marne), collected by Baron de Baye. Fig. 197 represents a human tibia with an arrowpoint inserted, found in the dolmen of Font-Rial near Saint-Affrique (Aveyron). Baron de Baye has been, after Dr. Prunières, one of the most successful seekers for these specimens. In the cavern of Villevenard he found one skull containing three tranchant-transversal arrowheads, while another was lodged between the dorsal vertebræ. Other human vertebræ pierced with flint arrowpoints were found in the caves of Petit-Morin. In one sepulchral cavern the Baron found 73 flint arrowpoints, and, as in the case of Villevenard, their position was such as to lead to the supposition that they had been sticking in the flesh of the body at the time of interment and had fallen down as decomposition progressed. A human vertebra was found by M. Cartailhac in the covered ways of Castellet, near Arles, with a stone arrowpoint incrusted therein. The absence of any exostosis shows that death quickly followed. The list of examples or specimens showing arrow wounds might be augmented considerably, but enough instances have been given to show that the use of arrows and other weapons was habitual, and no reason is known why an investigation, if carried to any considerable extent and in any great detail, might not make a large addition to the data already obtained.[1]

Fig. 197.
HUMAN TIBIA (PREHISTORIC) PIERCED WITH FLINT ARROWPOINT (TRANCHANT TRANSVERSAL).
France.

Fig. 198 (fig. 39—5531, Army Medical Museum) represents an ancient arrow wound in the skull of an aborigine. The skull was originally received by the Smithsonian Institution from Dr. C. Yates, Alameda County, California, and transferred to the Army Medical Museum. It shows a man of advanced age. A long flint arrowpoint had penetrated the skull through the left orbit, and the figure shows it in place as originally found impacted. This specimen is to

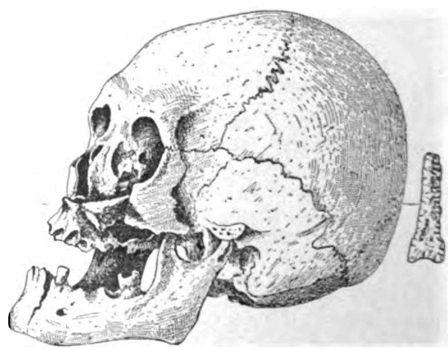
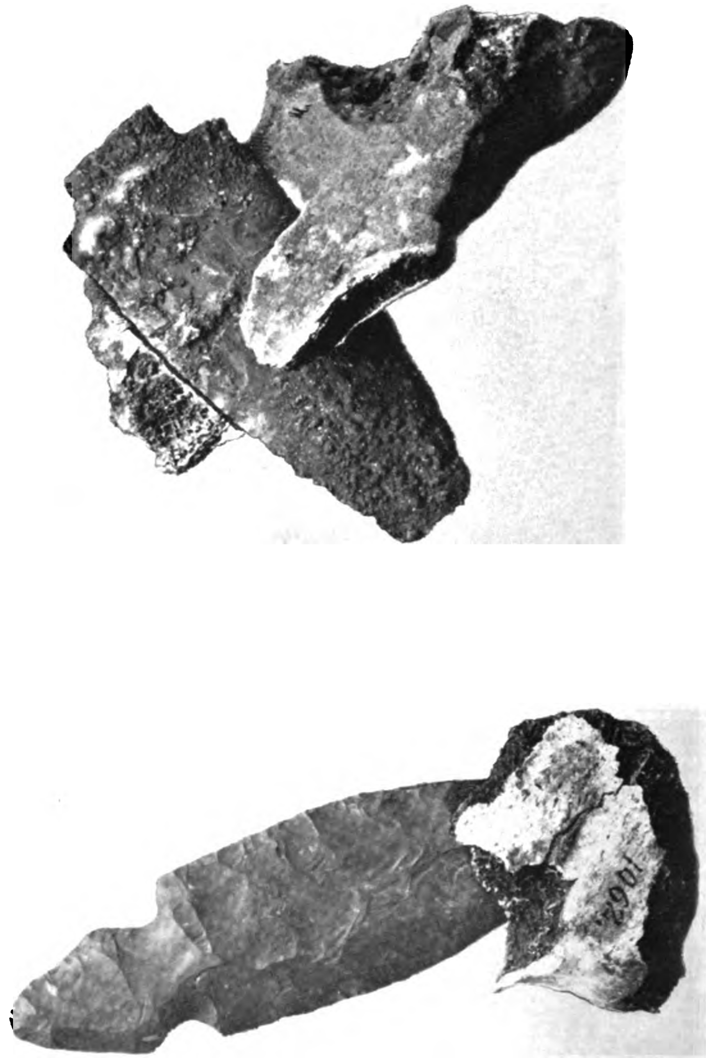


Fig. 198.
ANCIENT SKULL PIERCED WITH A FLINT ARROWPOINT, PERFORATOR.
California.

[1] Students desirous of pursuing the subject are referred to Cartailhac's La France Préhistorique, p. 124, figs. 124, 125; L'Anthropologie, VII, 3, 1896, pp. 312, 313, figs. 3, 4; G. de Mortillet, Materiaux, etc., 1877, VIII, p. 164, and others therein mentioned.



ARROWPOINTS OR SPEARHEADS INSERTED IN ANCIENT HUMAN BONES.

[illegible], Kentucky.

[illegible]

be remarked as one of a class called perforators or drills and possibly used as such, but here used as an arrowpoint.

Fig. 199 (fig. 37—5553, Army Medical Museum) is also a prehistoric specimen. It is from one of the Indian mounds in the vicinity of Fort Wadsworth, Dakota, excavated by Surg. A. T. Comfort, U. S. A., in

Fig. 199.

ANCIENT HUMAN VERTEBRA PIERCED WITH QUARTZ ARROWPOINT, HEALED.

Fig. 200.

ANCIENT SKULL PIERCED WITH PERFORATOR ARROWPOINT.

Illinois.

1869, and consists of a human lumbar vertebra with a small arrowpoint of white quartz incrusted in it. It is covered with a new bony formation, showing that the wounded man survived the injury some months at least.

Fig. 200 (Cat. Nos. 60281, 60282, U.S.N.M.) represents an ancient aboriginal skull from Henderson County, Illinois, forwarded by M. Tandy. It had a hole in the squamosal bone on the left side, in which, when found and received by the Museum, was a stone arrowhead, still another perforator or drill.

Fig. 201.

ANCIENT SKULL, ARROW WOUND OVER LEFT EYE ENTIRELY HEALED.

Missouri.

Fig. 201 (Cat. No. 173995, U.S.N.M.) represents a human skull from a mound in Missouri. The subject had received a serious wound in the supraorbital arch at the outside of the left eye. The wound involved all the bones of the interior arch, which was broken down. The wound had entirely healed, the cicatrization was complete, and all the wasted or destroyed pieces of bone around the wound had sloughed off and the reparation of the bone been fully effected. Of course the missile with which this wound had been inflicted did not remain in the wound, and it was not found, but from the smallness of the wound and its penetration one can only conclude it was made by an arrowpoint.

Plate 58 represents two prehistoric specimens of flint arrow or spear

heads found inserted in human bones. These specimens were sent to the U. S. National Museum by Dr. John E. Younglove, of Bowling Green, Kentucky. Fig. 1 represents an implement $3\frac{1}{2}$ inches long, $1\frac{3}{8}$ inches wide, and one-fourth of an inch thick. The stem is broken, which shortens it considerably. It had pierced entirely through the human pelvic bone in which it was found. Fig. 2 is 4 inches long, $1\frac{3}{8}$ inches wide, and one-fourth of an inch thick. It is inserted in the head of a human femur(?). Fig. 1 is loose so that it may be taken out of its present socket, while fig. 2 is firmly embedded and can not be removed. The material of both is the black or brown lusterless pyromachic flint common to the country in which it was found. The specimens came from a cavern about 4 miles northeast of Bowling Green, and an equal distance from Old Station. The opening at the surface was about 3 feet in diameter and the hole about 40 feet in depth. At its bottom the cave extended horizontally several hundred feet through solid rock. There is no way of telling whether these implements were used as arrows or spears; the shafts which would alone determine that have entirely disappeared, or at least no fragments of either wood or sinews were reported. If arrows, they must have been used with an enormous bow; it is more likely that they were mounted upon a larger and heavier shaft and used as spears or javelins.

Looking at these heavy projectiles, considering the conditions of the hand to hand fight wherein they were used, and the force with which they were hurled, it is astonishing that at least one of the fighters, if the specimens belong to different individuals, not only survived the shock, but the patient recovered with the weapon embedded in the wound, for its cicatrization is found to be complete.

APPENDIX A.[1]

MINES, QUARRIES, AND WORKSHOPS.

The following memoranda of prehistoric flint mines or quarries and workshops of aboriginal stone implements in the United States have been compiled mostly from reports made by investigators in the field. They are here brought together and published for convenience of the student.

MAINE.

Mount Kineo, on the eastern shore of Moosehead Lake, has furnished material for aboriginal arrowpoints and spearheads for hundreds of miles down the Atlantic coast. It is usually called Mount Kineo flint, but is really a porphyritic felsite or rhyolite.

NEW YORK.

Erie County.—Extensive flint-arrowpoint factories in the vicinity of Buffalo and along the river shore; marked by the presence of flint and piles of chipped pieces. Reported by Dr. A. L. Benedict, Buffalo.

Chautauqua County.—Some years ago, Mr. Williams, plowing a field on his farm, in the town of Sheridan, turned up as much as two bushels of flint spalls or chips and a number of arrowpoints and spearheads. These were together, and led Mr. Williams to suppose that Indians made their tools there. Some of these implements correspond in outline and material to those from Flint Ridge. Ohio. James Sheward.[2]

Montgomery County.—Deposit of flint arrowpoints in the town of Amsterdam. Described by P. M. Van Epps.[3]

NEW JERSEY.

Mercer County.—"Open-Air Workshops" (chips of jasper and flint) in Hamilton Township.[4]

"Open-Air Workshops" are treated at length by Dr. Abbott, and examples are cited; one near Belvidere, New Jersey, and one in Hamilton Township, Mercer County, New Jersey, which was greatly elaborated by excavation and description. The remains of human industry found in the quarries are thus classed by Dr. Abbott: (1) Masses of jasper and altered mineral; (2) cores and remains of no further use; (3) large flakes; (4) blocked-out and discarded specimens; (5) specimens nearly finished and then discarded—these are of the arrowheads with point, stem, or barb broken off; (6) chips and splinters of every size; (7) hammerstones of utilized pebbles, mostly with shallow depressions, one on each side; (8) flat-slab stones of small size and traces of hammering on either side, probably used as lapstones—making in all about a thousand pieces. There was no trace of argillite used as a material.

A second and third find in the same vicinity are described in the same paper (p. 516).

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[1] See p. 871.

[2] Smithsonian Report, 1881, p. 644.

[3] American Antiquarian, 1880, III, p. 57.

[4] C. C. Abbott, Report Peabody Museum, XII, 1880, pp. 508–515.

MARYLAND.

Quarry of rhyolite near Sugar Loaf Mountain. Dr. W. H. Holmes.

DISTRICT OF COLUMBIA.

Ancient quarries near Washington.[1]
Prehistoric quarries in the vicinity of Washington.[2]
Ancient village sites and aboriginal workshops.[3]
Contributions to the Archæology of the District of Columbia.[4]

A quarry of quartzite bowlders has been discovered on the hills at Piney Branch, together with an extensive manufactory of rude implements. It was excavated by Dr. W. H. Holmes and is described at length.[5]

WEST VIRGINIA.

Putnam County.—Ancient furnace, 4 miles east of Hurricane, on the farm of J. J. Estes. Described by Mr. P. W. Norris.

NORTH CAROLINA.

Cherokee County.—Ancient mining excavations on farm of Mercer Fain, near Colvard Creek, on north side of Valley River, 5 miles above Murphy. Other old mining indications in the same county. Reported by James Mooney.

GEORGIA.

Savannah River.—At some points, even in the depths of the swamp region, may still be noted traces of small open-air workshops. * * *

These exist not only along the line of the Savannah River, but frequently occur on the banks of the Oconee, Ocmulgee, the Flint, the Chattahoochee, and other Southern streams. * * * Within the past few years not less than 8,000 well-formed arrow and spearpoints have been collected on both banks of the Savannah where it separates the counties of Columbia and Lincoln in Georgia and Edgefield County in South Carolina. Even now the supply is by no means exhausted. The annual plowings and constantly recurring freshets reveal each season new examples of the taste and skill of these ancient workmen. In the enumeration of the implements taken from this locality we do not include multitudes partially formed and broken, which, with quantities of chips, still mark the spots set apart for the manufacture. Sometimes we encounter a locality, many yards long and several wide, the surface of which is covered to the depth of several inches with fragments struck off during the process of manufacture, and with cores and wasters abandoned from some inherent defect in the material or broken by the workman. Some idea may thus be formed of the extent and duration of the labors of these primitive workers in stone.[6]

Jefferson and Burke counties.—Dr. Roland Steiner, now of Grovetown, Georgia, has been, during almost his entire life, an enthusiastic collector, and has pushed his investigations in many directions throughout the State. He formerly lived near

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[1] Elmer R. Reynolds and F. W. Putnam, Report Peabody Museum, XII, pp. 475, 526–535.

[2] T. R. Peale, Smithsonian Report, 1872, pp. 430–432.

[3] S. V. Proudfit, American Anthropologist, II, pp. 241–246.

[4] Louis A. Kengla, 1883.

[5] American Anthropologist, January, 1890, III, p. 1; Fifteenth Annual Report Bureau of Ethnology, 1893–94, pp. 33–66; and American Naturalist, XXX, December, 1896, pp. 874–885; No. 360, December, 1896, pp. 976–992.

[6] Charles C. Jones, jr., Smithsonian Report, 1879, pp. 378, 379.

Waynesboro, in Burke County, and from that neighborhood he obtained many implements and made many important discoveries. He reports that there are outcrops of jasper on Rocky Creek, at the crossing of the Waynesboro road. Other quarries were found in the neighborhood; one of white flint at Erin, and one of yellow flint at Oldtown, 10 or 12 miles west in Jefferson County. There were workshops on what he calls the Davis plantation or the Old Evans place, at the crossing of Little Buckhead Creek by the Waynesboro road; one of these was 2 miles up the stream at Captain Ridgely's. Dr. Steiner exhausted this neighborhood in his search. He found on the Old Evans place, in the valley of the Little Buckhead, within an area of 40 acres, no less than 16,000 prehistoric implements, most of which were of the same material as the neighboring quarries and had probably come from them, but many of them were of different material and had come from different and perhaps distant quarries.[1]

There is in the U. S. National Museum a collection of arrow and spearheads called, after its finder, the McGlashan collection, from Georgia. It comprises about 20,000 specimens. They are of divers forms and sizes, are all of cherty flint, and apparently from one quarry. They are much weathered and their color ranges from yellow and rose to white. Plate 38, figs. 20–23 are photographs of specimens from the collection and show the appearance of the material.

FLORIDA.

Hernando County.—Arrowpoint factory on the banks of Trouble Creek, 2 miles north of the mouth of the Anclote River, and 5 miles south of Kootie River.

"About 5 miles south of the Kootie River, and some 2 miles north of the mouth of Anclote River, is a small stream called Trouble Creek. A considerable body of blue flint rock occurs here, cropping out along the shores of the creek, with scattering nodules lying in all directions. This point was evidently used for a long time by the aborigines as a factory for arrow and spear heads. Bushels of chips and fragments strew the ground, and large quantities have been washed from the banks of the creek and cover its bottom. A long search revealed nothing except a few arrowpoints and spearheads spoiled in making, and a lot of broken pottery."[2]

ALABAMA.

Lee, Jefferson, Lowndes, and Talladega counties.—Mica mine and stone wall in Clay Township, Jefferson County, Alabama. In Talladega County, township 20 north, range 6 east, section 12, another mica pit. "Workshop" in Lee County, Alabama, east of Youngsboro, on the Western Railroad, at the foot of Story's Mountain in the fields, township 19 north, range 27 east. William Gesner.[3]

Several "workshops" are near Mount Willing, one on Mr. Hartley's plantation, section 36, township 18 north, range 13 east, and one on Mr. Lee's plantation, section 32, township 13 north, range 14 east. Described by William Garrett.[3]

"Workshops" in township 18 north, range 7 east, of Talladega County, on the headwaters of Talladega Creek, at the eastern end of Cedar Ridge, a spur of the Rebecca Mountain (Potsdam sandstone), in the old fields where the Montgomery Mining and Manufacturing Company's works were situated; wagonloads of quartz fragments, broken arrowpoints, and spearheads cover the ground; but on a much larger scale appears to have been the manufacture of these implements in township 19 north, range 27 east, of Lee County, on the Columbus, Georgia, branch of the Western Rail-

[1] R. Steiner, private letters.
[2] T. S. Walker, Smithsonian Report, 1879, p. 394.
[3] W. M. Garrett, Smithsonian Report, 1879, p. 443.

road, east of Youngsboro, for in the fields on the southeastern side of a low ridge called Story's Mountain, acres are covered with the broken quartz in every variety of that mineral found in this hill, from transparent rock crystal to jasper and chalcedony, among which occasional good implements occur.[1]

OHIO.

Licking and Muskingum counties.—Throughout eastern Ohio there are numerous deposits of flint of various descriptions, and in several counties places are to be found in which the "ancient arrow maker" practiced his calling with the material so abundantly supplied.[2]

Flint quarry on Williams Hill, Licking County, 3 miles west of Brownsville. Reported by Gerard Fowke.

Chandlersville, Salt Creek, Muskingum County, Ohio, was the scene of the operations of the Muskingum Mining Company in 1820 for mining silver. It was on the National road, 10 miles east of Zanesville. A writer, evidently well-known, though his name is not given, tells[3] of a trip he took through this country, and describes the wells and pits sunk here by the company in which he was a subscriber, part owner, and heavy loser. He says, in his report of excavations and drillings, that at a depth of 120 feet they struck a bed of gray flint rock, 6 or 8 feet in thickness. He continues the record of his journey:

"One mile east of Somerset the National road commences crossing at Flint Ridge. [Plates 13-15.] Its general course is from northeast to southwest, passing through the counties of Coshocton, Licking, Muskingum, Perry, Hocking, and Jackson, and probably into Kentucky. In Hocking County it seems to have been deposited in a fine siliceous paste of various colors, from pure white to yellow, clouded, and black, and is used for whetstones. In Jackson and Muskingum counties it is extensively manufactured into buhr millstones. The whole deposit abounds in casts of fossil shells beautifully replaced in many cases by pure quartz. Some are studded over with drusy crystals, others filled with chalcedony and quite translucent. The various families of Producti, Ammonites, Nautili, Encrine, etc., with many undescribed species, are found here. * * * In many places it abounds in jasper, hornstone, flint, quartz, chalcedony, etc., of various and intermingled colors" (p. 233).

Washington County.—A "magazine" of arrowpoints and spearheads at Waterford, near the banks of the Muskingum.[4]

Perry County.—Flint diggings at New Lexington.

"At New Lexington, Perry County, Ohio, on a knoll near the railroad station, are many ancient flint diggings. The flint here constitutes a regular layer or stratum in the coal measures and is about 4 feet thick. It is well exposed in the railroad cut on the side of the knoll. Geologically speaking, the flint is a local modification of the Putnam Hill limestone, a well-defined stratum of wide extent in southeastern Ohio. Many of the pits must have been from 6 to 8 feet deep. The flint is fossiliferous, and much of it is not compact enough for arrowheads, and around the old excavations are heaps of the rejected material. These excavations are now largely refilled with earth and débris. I had no time to reopen any of them in search of the tools by which the flint was quarried. I have little doubt that these pits were sunk by the mound builders."[5]

Mahoning County.—Flint diggings in the southwestern corner of the county. Reported by Mr. Gerard Fowke.

Coshocton County.—Deposits of chalcedony, basanite, etc., on land of Col. Pren. Metham, Mr. R. R. Whittaker, and Mr. Criss, in the south-central portion of Jefferson Township. Reported by Mr. Gerard Fowke.

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[1] William Gesner, Smithsonian Report, 1881, p. 617.
[2] Charles M. Smith, Smithsonian Report, 1884, p. 853.
[3] American Journal of Science and Arts, XXV, p. 226.
[4] Haywood, Natural and Aboriginal History of Tennessee, p. 35:.
[5] E. B. Andrews, Report Peabody Museum, X, pp. 53, 54.

INDIANA.

Crawford County.—Mr. H. C. Hovey gives an account of a flint mine and workshop in Wyandotte Cave.[1] He says that there are what had been called "bear wallows" not far from the Pillard Palace. "These are circular depressions, twenty or more in number, each a yard wide and a foot deep, and their appearance agrees well with their name. About two years ago, however, I had the satisfaction of proving them to be the remains of ancient flint works. Happening to remove the clay crust from a bear wallow, I found a pile of ashes and cinders on one side and a quantity of flint chips on the other. On examination this proved true of each wallow. Further removal of the crust brought to light hundreds of flinty prisms with parallel faces and averaging 4 inches in length by 1½ in width and half an inch in thickness.

"The mine is near by, abounding in flint nodules lying in rows in the cave walls, and occasionally in bands or belts. Each nodule has a coating of some grayish mineral, perhaps discolored flint, and between them is usually a soft, chalky substance, easily cut by a knife. Freshly fractured, a bright black surface appears, in contrast with the dingy, faded blocks by the wallows. This change of hue is due to the gradual removal of the traces of iron found with the silex. Many of the blocks were rejected on account of flaws or imperfections. The nodules are easily split into this form, which is convenient for transportation. Arrow making, however, was carried on here to a considerable extent, as appears from the chips. Pounders like those in the alabaster quarries were found along with the flints, showing the means of breaking the nodules.

"The only manufactured article dug up in this spot was a little stone saucer containing a soft, black substance. This may have been a rude lamp.

"Search at the mouth of the cave unearthed quantities of flint chips, and also finished arrowheads. The question has been raised why the Indians should delve for flint balls amid subterranean darkness when quantities of such spheres are found along the beds of streams and elsewhere in the open air. The reason is that the latter, having been exposed to the elements, have deteriorated in quality; they also break with irregular cleavage. Hence the Indians sought to get flints fresh from the strata where they were originally deposited, and which, because of their moisture, readily part into triangular prisms under the hammer.

"Since finding the existence of this flint mine in Wyandotte Cave, I have learned of the flint pits dug along Indian Creek and elsewhere in Harrison County, Indiana."

Franklin County.—Workshops have been discovered on sections 3, 4, and 20, township 9 north, range 2 west; section 10, township 12 north, range 13 east.[2]

Union County.—Workshops on sections 12 and 17, township 10 north, range 2 west; sections 4 and 9, township 11 north, range 2 west; sections 21 and 29, township 12 north, range 2 west; and sections 27 and 36, township 13 north, range 13 east.[3]

Fayette County.—Workshop N. W. ¼ of S. W. ¼ section 36, and S. W. ¼ of S. E. ¼ section 27 township 13 north, range 13 east.[4]

ILLINOIS.

Union County.—"Three miles west of Cobden, near Kaolin Station, on the St. Louis and Cairo Railroad, is the most extensive workshop I have found. It covers several acres of ground, and carloads of flint chips and bowlders are strewn everywhere. Four miles south of Cobden is another of smaller dimensions. Others of greater or less size are met with in various parts of the county, but no relics of much value are found with them."[5]

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[1] Proceedings, American Association for the Advancement of Science, XXIX, 1880, p. 730. Boston.

[2] George W. Homsher, Smithsonian Report, 1882, pp. 730–749.

[3] Idem., pp. 728–749.

[4] Idem., pp. 737–749.

[5] F. M. Farrell, Smithsonian Report, 1881, pp. 584–586.

Extensive flint quarry near the town of Mill Creek. This quarry is of the white chert peculiar to Illinois, and furnished the large oval chipped implements supposed to have been used as digging tools or for agricultural purposes. The quarry was discovered in May, 1899, by Dr. W. A. Phillips and Edward F. Wyman, and opened by Drs. Phillips and Dorsey, of the Field Columbian Museum.[1]

TENNESSEE.

Cooke County.—Workshop on the ridge. Quantities of flint chips, etc., scattered over the ground. Reported by J. W. Emmert.

KENTUCKY.

Ohio County.—A flint implement factory on Wade N. Martin's farm, Cromwell postoffice. Reported by Mr. J. M. Brown.

Wyandotte County.—There are a number of mounds near Wyandotte, Kentucky, of which a map is in preparation. A workshop 1 acre in extent and covered with chips and shreds is reported.

"About two years ago I discovered on the farm of J. L. Stockton, 1 mile northwest of this city, remains of an aboriginal workshop or village. It is located on a small stream called Jersey Creek, and near a large spring. It covers an area of about 2 acres. The soil is sandy, and to the depth of 2 feet is a complete mixture of flakes of flint, ashes, bones—both animal and human—fragments of ornamented pottery, broken and unfinished stone implements of nearly every description. * * * There are no deposits of flint or other stone valuable for arrow making, etc., in this vicinity. The axes, celts, skin dressers, and balls are all made of porphyry, and the arrowheads of flint."[2]

TEXAS.

Goliad County.—Flint workshop on the margin of Lone Tree Lake, 2 miles west of San Antonio River, and 7 miles south of the town of Goliad. The lake margin was of sand, covering, to a depth of 4 or 5 feet, the flint workers' site. This was about 150 yards long by 50 wide, the débris, chips, flakes, arrowpoints, spearheads, and tools, being on and in the clay under the sand, and estimated at 10 bushels in sight.[3]

ARKANSAS.

Garland County.—Quarries of novaculite were found in Garland County, Arkansas.[4] Dr. Holmes reports everywhere the aborigines found and worked these transported masses (from the quarry), and hundreds of square miles are strewn with flakes, fragments, failures, and rejected pieces, and the country around, from the mountains to the Gulf, is dotted with the finished forms that have been used and lost.

Hot Springs County.—Ancient novaculite mines near Magnet Cove.[5]

Novaculite is one of the varieties of flint and, where obtainable by prehistoric man, was much used for the larger and ruder kinds of implements.

The subject of novaculite quarries is treated by Mr. L. S. Griswold, under the title of "Whetstones and Novaculites of America."[6]

The Quarterly Geological Journal[7] contains the report of an investi-

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[1] George A. Dorsey, Report of Field Columbian Museuem, June, 1899.

[2] E. F. Serviss, Smithsonian Reports, 1879, p. 433; 1881, p. 528.

[3] J. D. Mitchell, Victoria, Texas, letter of June 24, 1894.

[4] W. H. Holmes, American Anthropologist, October, 1891, p. 313.

[5] W. P. Jenney, American Anthropologist, October, 1891, p. 316.

[6] Annual Report of the Geological Survey of Arkansas, 1890.

[7] London, Vol. L, Pt. 3, No. 199.

gation by Mr. Frank Rutley on "The origin of certain novaculites and quartzites."

Clark County.—Aboriginal workshop in section 17, township 5 south, range 23 west, from which arrowpoints and cutting implements, the latter hatchet-shaped and made of a species of iron ore, have been taken.

"On section 9, township 3 south, range 24 west, is an outcrop of novaculite or flint of tough quality and of various colors. From this material large quantities of arrowheads, etc., have been made. The ancient artisans went down on the south side of the outcrop, which is a ledge 700 or 800 feet above the adjacent valley, and carried away immense quantities. The material is the same as that of arrowheads from Tennessee, Mississippi, and westward.

"There is on Capt. R. S. Burk's farm, section 17, township 5 south, range 23 west, evidence of an extensive workshop in arrowpoints and cutting implements. The arrow material was taken from the quarry above described, although 10 miles away. The cutting instruments were of the hatchet kind and made from a species of iron ore. There is another workshop near my home, section 7, township 4 south, range 24 west, Montgomery County, Arkansas."[1]

WISCONSIN.

Kenosha County.—Lapham[2] says: "At the city of Kenosha we found, on the ancient sandy beach upon which the city is partly built, abundant evidence of a former manufactory of arrowpoints and other articles of flint. Several entire specimens were collected in a little search, besides numerous fragments that appear to have been spoiled in chipping them into form. * * * Many different kinds of flint, or chert, were wrought at the place, as shown by the fragments. It is probable that the pebles and bowlders along the lake shore furnished the material. * * * These pebbles are the corniferous rock of Eaton and here constitute a portion of the drift, being associated with the tough blue clay that underlies the sand and is the basis of the country around. The clay is carried away by the dashing waves, leaving a beach of clean pebbles. Numerous fragments of pottery of the usual form and composition were also found in the same sandy places."

INDIAN TERRITORY.

An extensive novaculite quarry was discovered and reported to the U. S. Geological Survey by Mr. Walter P. Jenney, which he says was known as the "Old Spanish mines." This report, made in 1891, resulted in the visit of Dr. W. H. Holmes to the locality for the purpose of investigation and study. "The quarry is situated on the Peoria Reservation, about 7 miles northwest of Seneca, Missouri, and some 10 miles southeast of Baxter Springs, Kansas. From Seneca the spot is reached by driving northward along the Missouri border for 5 miles and then crossing the line and proceeding 2 miles in a westerly course through the forest. The country is a gently rolling plateau, with a gradual descent westward into the valley of Spring River, a branch of the Neosho or Grand River, which falls into the Arkansas at Fort Gibson, Indian Territory."

Dr. Holmes's investigations were published in a bulletin of the Bureau of Ethnology, entitled "An ancient quarry in Indian Territory," 1894. Dr. George A. Dorsey visited this quarry in 1899.[3]

WYOMING.

Central-eastern Wyoming.—Quartzite quarry in central-eastern Wyoming, 40 or 50 miles east of Badger, on the Cheyenne and Northern Railroad, 125 miles north of Cheyenne. Nineteen ancient diggings were cleaned out and the whole quarry inves-

[1] A. Jones, Smithsonian Report, 1881, p. 542.
[2] Antiquities of Wisconsin, p. 6.
[3] Report, Field Columbian Museum, June, 1899.

tigated. The work was various, superficial, and of great extent. Quarries, shallow, 2 and 3 feet deep, others 15 to 20 feet deep; tunnels and shafts not very deep. Spearpoints, scrapers, axes, and anvils were found; quarry tools, hammers, and mauls were made of bowlders of granite and quartzite, "brought from the neighboring mountains, some 20 miles away." The quarry ground was strewn with chips and fragments of quartzite, but not in heaps as where implements have been made. "The striking points are the vast amount of work done, the absence of chip heaps, the rude nature of the implements, and their great size. The tonnage of rock moved is estimated by hundreds of thousands, if not by millions of tons. * * * Implements made from quartzite resembling that quarried are common on the plains and in the mountains. * * * The quarrymen must have been aborigines, but unlike the Indians of modern times they must have been laborers and to have worked centuries in order to have accomplished so much with the crude tools used. Who they were will never be known. * * * Central-eastern Wyoming is noted for prehistoric quarries, but as a rule they are small and shallow and in no way comparable to the recent discovery. Usually the Indians worked for jasper and agate, and dug irregular openings that do not represent the present systematic development. Quartzite quarries are extremely rare and these are by far the largest reported in Wyoming."[1]

Raw Hide Range.—Dr. A. J. Woodcock reports his visit, in company with and under the guidance of Mr. W. F. Hamilton, of Douglass, Wyoming, to certain flint (?) mines and aboriginal workshops on the Raw Hide Range, southwest from the Black Hills and near Muddy Creek, a branch of the Platte River. About 4 acres had been dug over, and rude pits made from 6 to 12 feet deep, in excavating the desired flinty rock, which lay at that distance below the surface. The stone gave a metallic ring when struck, and broke with a conchoidal fracture. It had "a wealth of color, the basic tints of which were pink, purple, gray, and white, with their intermediate shades, * * * in the shape of chipped tools and weapons * * * so scattered for hundreds of miles throughout the west, * * * through the Powder River country, the Black Hills, the Bad Lands of South Dakota, the Big Horn Mountains, and the great basin of the same name." Mr. Hamilton said he had never seen this material in the ledge elsewhere than in this locality.

The different forms ranged from the quarry spall to "a barbed harpoon head of chipped and polished stone." They picked up a stone hammer weighing 5¼ pounds. The disks were plenteous, some of them 20 inches in circumference and 2 inches in thickness, chipped to a cutting edge. "A thousand trainloads of chips and spalls were beneath our feet on this one butte alone, and Mr. Hamilton said that several others had been worked."

COLORADO.

Jefferson and Clear Creek counties.—"In a small grove of cottonwood trees near Apex, Colorado, the Indians appear to have made, in former times, great quantities of tools and arrowheads, for the ground all around is strewn with tools, chippings, and arrowpoints, some of the latter made of beautiful stone and of the most exquisite workmanship. Within the space of an acre or two we have found about a hundred arrowpoints and ten axes and hammers. The Indians seem to have carried on quite a trade among themselves, in order to procure the materials for arrowpoint-making, as some of the chippings found in their encampments are from stones which can not be found within several miles of this place, and some, I think, have been brought from distant localities. Although the Indians used several kinds of stone in the manufacture of arrowpoints, yet they seem to have had a preference for quartzite, chalcedony, and jasperized wood, probably on account of their superior hardness, and may have made others from handsomer but less durable stones only for purposes of barter, as the Indians of California exchanged arrowheads made of bottle glass.

[1] Wilbur C. Knight, Science, new ser., VII, March 4, 1898.

The following minerals were employed in the manufacture of tools: Moss agate, chalcedony, carnelian, wood opal, sapphirine, petrified wood, flint, red jasper, brown quartzite, agatized wood, obsidian yellow quartzite, purple and yellow jaspers, smoky quartz, chert, jasperized wood, red quartzite, besides several undetermined silicates."[1]

NOVA SCOTIA.

Lunenburg County.—A workshop was reported[2] at Bockmans Beach, Lunenburg County. Large quantities of flakes and splinters of stone, and arrowheads in various stages of preparation.

[1] George L. Cannon, Smithsonian Report, 1877, p. 237.
[2] George Patterson, Smithsonian Report, 1881, p. 675.

APPENDIX B.[1]

CACHES.

In caching or secreting his implements, prehistoric man followed no uniform method of placement, but the deposits are shown to have been intentional. The implements were laid in a circle or rectangle and were placed flat, on edge, or sometimes on end. Leaf-shaped implements have been frequently found en cache, and have been called by some "cache implements," but arrowpoints and spearheads, grooved axes, polished stone hatchets, large chipped flints, spades, and other implements have also been found en cache. It will be seen at once that the term "cache implements" can not with propriety be applied to any particular one.

Reports of caches have been made by their discoverers, and these have been here brought together and published for the convenience of the student.

NEW HAMPSHIRE.

Manchester.—Cache of 40 chipped implements.[2]

MASSACHUSETTS.

Framingham.—"A peck of chipped implements," cached.[3]

CONNECTICUT.

Stratford, Fairfield County.—Cache, number not given. Robert Curtis, in Cyrus Thomas's Catalogue of Prehistoric Works east of the Rocky Mountains.

East Windsor Hill, Hartford County.—Cache of 14 specimens.

South Windsor, Hartford County.—Cache of 100 specimens.[4]

NEW YORK.

Dutchess County.—A cache of arrowpoints was found upon the farm of Mr. George Allerton, at Green Haven, 12 miles from Fishkill on the Hudson. While employed in digging, his spade brought up a number of arrowpoints. He described them to be nicely piled up side by side edgewise, in two or three rows, 10 to 15 inches below the surface.. There were perhaps 200 or 300 in all. They are of a blue jaspery flint, and seem to be in an unfinished condition.[5]

Sheridan, Chautauqua County.—Cache of 2 bushels of specimens on farm of Mr. Williams.[6]

Allegany County.—Mr. E. M. Wilson, of Belfast, Allegany County, New York,

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[1] See p. 871.

[2] E. P. Richardson, Smithsonian Report, 1879, p. 447.

[3] J. H. Temple, Smithsonian Report, 1879, p. 448.

[4] E. W. Ellsworth, Smithsonian Reports, 1881, pp. 661, 662; 1879, p. 447.

[5] Edwin M. Shepard, Smithsonian Report, 1877, pp. 306, 307.

[6] James Sheward, Smithsonian Report, 1881, p. 644.

reports that at the old "Iroquois fort," in the town of Angelica, Allegany County, about 1½ miles north of the New York Lake Erie and Western Railroad station of Belvidere were found "many arrow and probably spear heads, unearthed from a small hole near the surface of the ground some distance south or southwest of the inclosure. This was done a few years ago." Also, "there was another and probably similar work [fort] 2 or 3 miles south of the Belvidere 'fort' and on the outskirts of the village of Belmont. * * * A large number of stone implements were found in a hole or cache near by, several years ago."

Broome County.—A cache of arrowpoints, knives, and axes, some in perfect condition but others broken, found near Binghamton.[1]

Montgomery County.—Mr. Percy M. Van Epps, of Glenville, New York, reports[2] a cache of 117 arrowpoints on the farm of Mr. Thomas Romeyn, in the town of Amsterdam, near a spring. They lay about 6 inches below the surface, on a bed of ashes 3 inches thick, which rested on a hearth or fireplace, about 10 feet square, of cobblestones from the drift. The arrowpoints average about 3 inches in length and are of dark-blue and gray flint, leaf-shaped. Mr. Van Epps adds: "Such hoards of arrowpoints are frequent in this vicinity. I know of four instances in a radius of as many miles."

Cache of 120 triangular implements (Division II), straight base, concave edges, of black flint, from Amsterdam, Montgomery County, found by Mr. Percy Van Epps. (Cat. No. 169624, U.S.N.M.)

Saratoga County.—Cache of 90 leaf-shaped implements (Division I, Class B) of hornstone, from Saratoga County, New York, found by H. B. McWilliamson (Cat. Nos. 170333, 170573, U.S.N.M.), represented by 16 and 62 implements, respectively.

Oswego County.—On the line dividing the towns of Volney and Schroeppel was an earthwork on a hill. A long wall, separating the hill from a marsh on the east, still remains. Arrowpoints of flint, en cache, have been plowed up.[3]

NEW JERSEY.

Burlington County.—Cache of 300 triangular arrowpoints (Division II), straight base, convex edges, of gray flint. Found on the south bank of Rancocas Creek, near Lumberton, Burlington County, New Jersey, by W. H. Chambers. (Cat. No. 98740, U.S.N.M.) Average size, 3⅝ by 1⅛ by $\frac{3}{16}$ inches.

Mercer County.—In 1861 a farmer near Trenton, New Jersey, while plowing, discovered a cache of stone implements about 15 inches below the surface. Dr. Abbott was notified and repaired to the place, secured the collection, and made a full description of the deposit.[4] The collection numbered about 150 specimens. They were of jasper, finely chipped, leaf-shaped, with a square base (Division I, Class B), and varied in size from 5½ to 7 inches in length, 2½ to 3 inches in width. Two-thirds of the number were arranged in a series of concentric circles, each circle fitting within the other, and they stood upright on their bases. The other third lay flat on their sides and were so placed as to form a wall on the outside.

Trenton.—Mr. Ernest Volk excavated an extensive village site in the neighborhood of Trenton, between that and Dr. Abbott's house and between the road and the bluff. Mr. Volk cites as evidence against the theory of rejects that he found in a single cache, 2½ feet below the surface, where it had evidently been placed for safety, a pile of 15 pieces of chipped argillite, but one of which could have been a completed implement. It was somewhat leaf-shaped. All the rest would have passed, according to the theory, for rejects, but were really selected and secreted, intended, doubtless, to be used at a future time for making implements.

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[1] Frank M. Edwards, American Archæologist, August, 1898, p. 221.

[2] American Antiquarian, III, p. 57.

[3] W. M. Beauchamp, Smithsonian Report, 1881, p. 649.

[4] Academy of Natural Sciences, Philadelphia, October 27, 1863, p. 278.

PENNSYLVANIA.

Chester County.—Edward T. Ingram, of Marshallton, discovered a cache of 95 leaf-shaped implements (Division I, Class B), square at the base, 5¼ to 7 inches long, 2½ to 3 inches wide, and about three-eighths of an inch thick. They are the counterpart of figs. 102 and 103, and also of No. 3 on Plate 29, Class B, the Abbott specimens heretofore described, in this classification. Mr. Ingram made a division of the implements and sent 61 of them to the U. S. National Museum, where the author has set them up in the form of a cache, as they were found. It is represented in section, as though it had been cut in the center perpendicularly from top to bottom and one-half the earth taken out, leaving the implements projecting as in their original location. The cast is of plaster, reproducing the earth. The original implements are used to represent the exposed half of the cache, leaving the imagination to supply the rest, which are supposed to be within the bank of earth and not to be seen. They were laid flat on their sides, their points to the center, overlapping each other where they came in contact. The entire cache is about 15 or 16 inches in width—a little more than twice the length of the implements. They were laid in a circle, nine or ten of them. This made nine or ten layers and was equal to a height of 14 inches. The top layer was about the depth of a furrow beneath the surface. All former plowing had escaped them, but on the present occasion a deeper furrow had turned them up, and so they were discovered. Plate 59 represents the plan of the cache and shows one layer of the implements.

Cache of 14 or more leaf-shaped (Division I, Class B) argillite implements, found near Brandywine Creek, in Chester County, about 2 miles from West Chester, Pennsylvania. A. Sharpless. (Cat. No. 62374, U.S.N.M.)

DISTRICT OF COLUMBIA.

Cache of 7 stemmed, shouldered, but not barbed (Division III, Class B), implements of quartzite. Found in a bank 2 feet below the surface opposite the navy-yard, District of Columbia. (W. Hallett Phillips collection, Cat. No. 195926, U.S.N.M.)

MARYLAND.

Howard County.—Fifty-two specimens.

Anne Arundel County.—Five caches containing, respectively, 26, 25, 27, 11, and 4 specimens. The foregoing caches are reported by Mr. J. D. McGuire, of Ellicott City, Maryland, and the implements are in his collection.

WEST VIRGINIA.

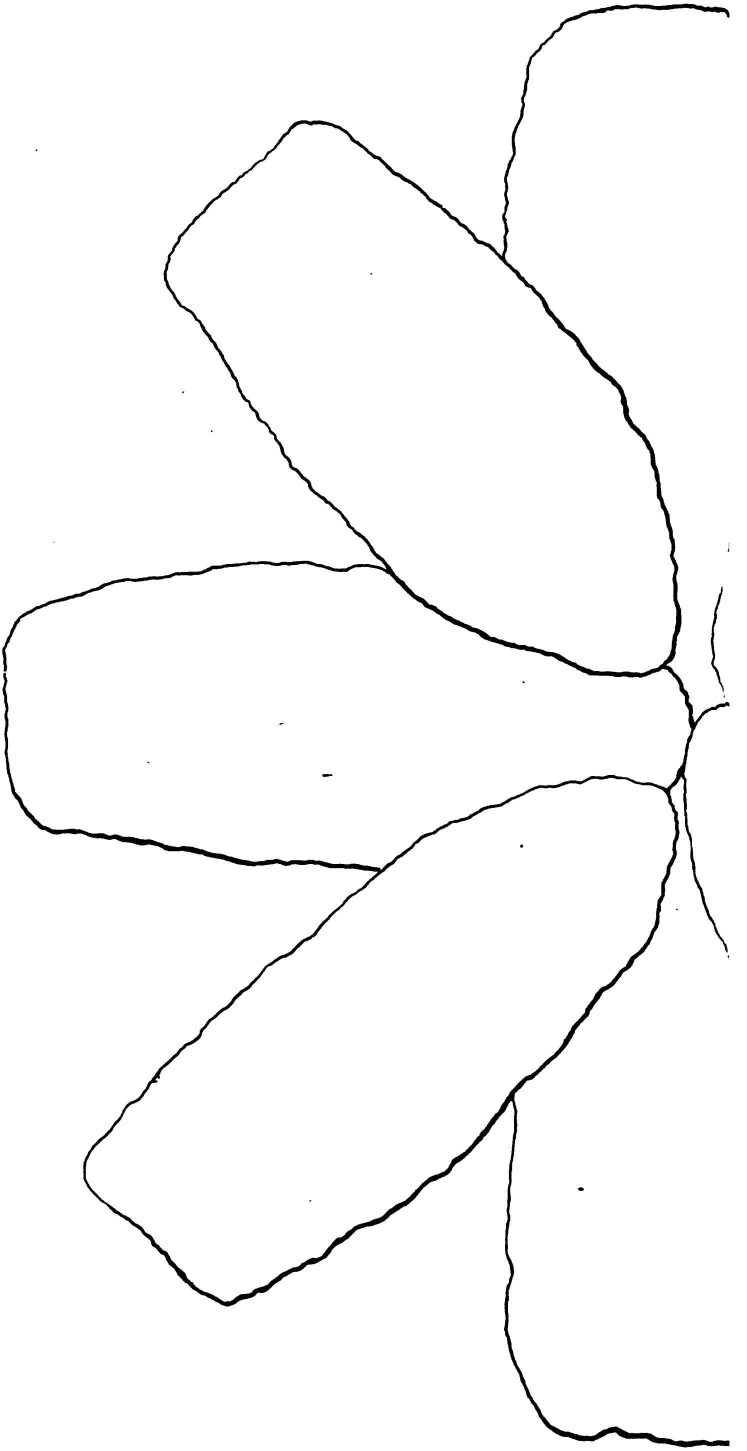
A cache of 400 leaf-shaped implements (Class B) is reported by Dr. J. F. Snyder, of Virginia, Cass County, Illinois, as having been found in West Virginia, locality not given.[1]

NORTH CAROLINA.

Caldwell and Alexander County line.—Dr. J. M. Spainhour, of Lenoir, North Carolina, found a cache of 597 leaf-shaped arrowpoints near the Caldwell and Alexander County line, North Carolina, 16 miles east of Lenoir, in a circular hole in the ground 9 inches in diameter, 25 inches deep. They occupied 13 inches of the excavation, which was filled with earth to the surface. These implements vary in length from 2¼ to 4 inches, in width from 1¼ to 1½ inches, and are ¼ to ⅜ inch thick. The material is porphyritic felsite (called rhyolite when it shows the flow structure), used so much by the aborigines from Maine to Georgia. (Cat. No. 149662, U.S.N.M.)

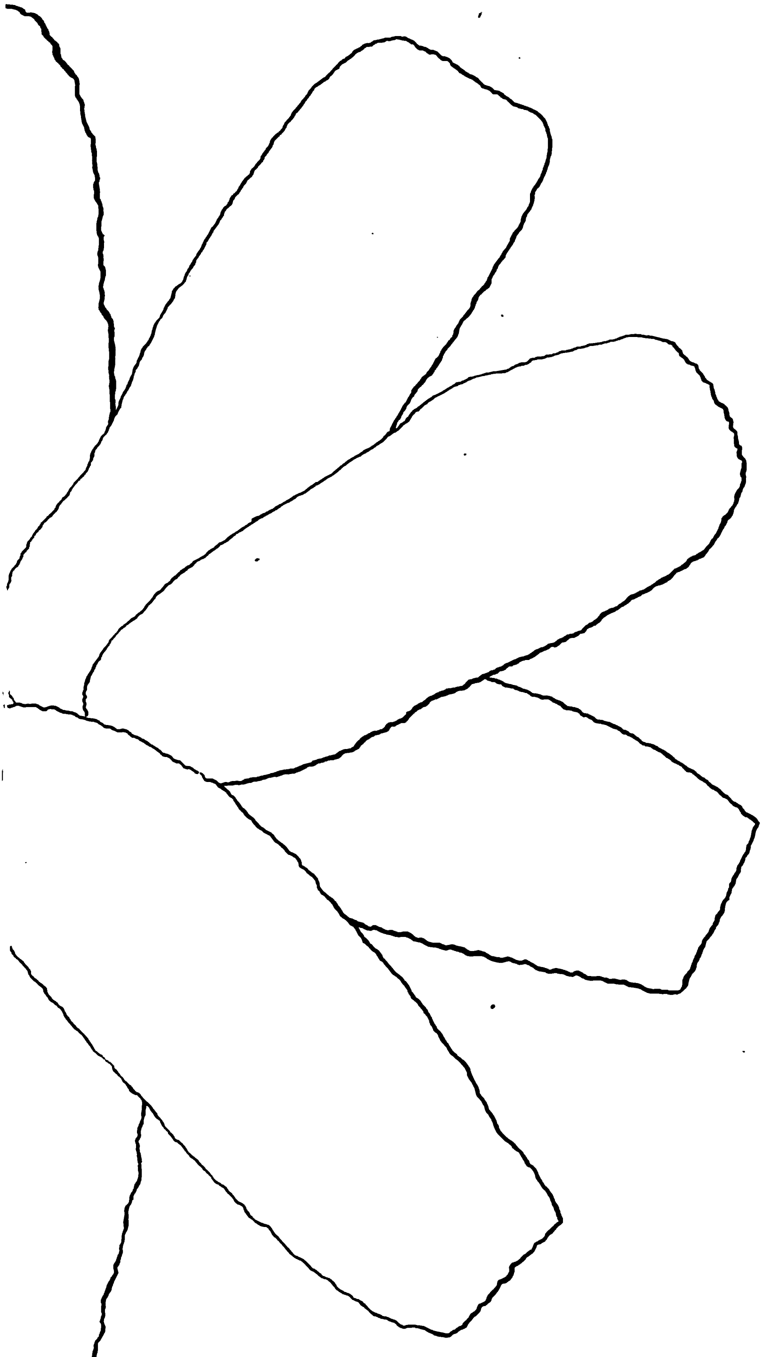
Fifteen leaf-shaped (Division I, Class B) rhyolite implements, found en cache surrounding a spring, as represented in Plate 60, at the head of a rivulet near the foot

[1] Smithsonian Report, 1881, p. 565.



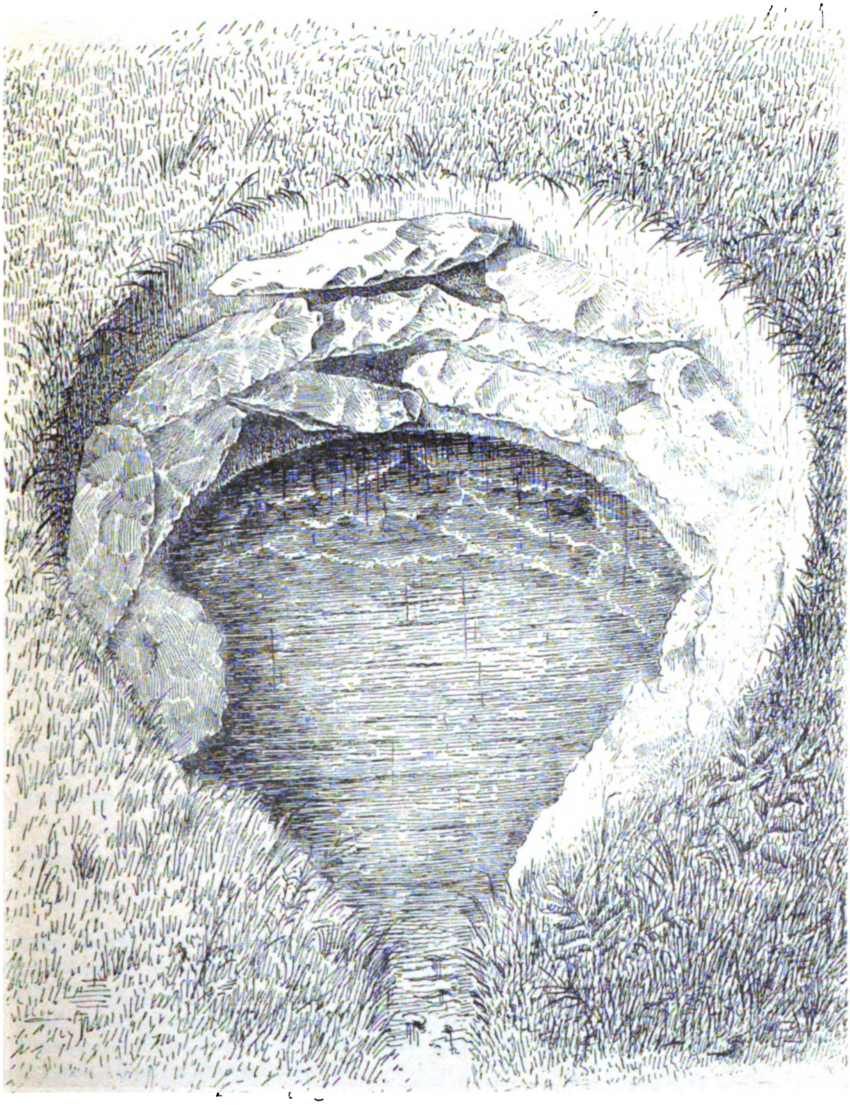
PLAN SHOWING ONE OF LAYER OF CACH

Chester Count



...NE OF NINETY-FIVE ARGILLITE IMPLEMENTS.

...ty, Pennsylvania.



PLASTER CAST (MODEL) OF A SPRING NEAR HIBRITEN MOUNTAIN, NORTH CAROLINA, SHOWING FIFTEEN LEAF-SHAPED IMPLEMENTS IN CACHE.

Lenoir, North Carolina.

Cat. No. 149662, U.S.N.M. Found by Dr. J. M. Spainhour.

of Hibriten Mountain, 2 miles east of Lenoir, were also found by Dr. Spainhour; 5¼ by 2¾ inches by ½ inch.[1]

Alexander County.—Cache of 96 small leaf-shaped (Division I, Class B) rhyolite implements. Average size 2 by 1⅛ by ¼ inches. J. D. Stephenson (Cat. No. 61950, U.S.N.M.). "This deposit [cache] was found buried in the soil against a large rock near the Catawba River in the southeastern section of Alexander County. I know of no locality nearer than 70 miles from which the material of which they are made can be obtained."

SOUTH CAROLINA.

Aiken County.—Dr. Roland Steiner, of Grovetown, Georgia, reports, April 27, 1895, that "I send a cache of rhyolite or schist arrowpoints, 65 in number, triangular and rudely stemmed, found in North Augusta on the South Carolina side of the Savannah River, opposite Augusta, Georgia." These were received in due course by the U. S. National Museum, and are catalogued as No. 170768.

GEORGIA.

Col. Charles C. Jones, jr., makes a somewhat elaborate description of the primitive manufactures of spear and arrow heads. He quotes at length from Catlin the methods observed by him and reported in his "Last Rambles amongst the Indians."[2]

The McGlashan collection (Cat. Nos. 131966–132250, U.S.N.M.) contains 20,000 specimens of arrowpoints or spearheads, all gathered by a single person from a single locality, and largely of one material. They belong to Division III, stemmed, sometimes shouldered and barbed. These were not reported as en cache, but it is probable many of them were.

FLORIDA.

Brevard County.—Cache of 12 or 13 pendant ornaments, or "plummets, pendants, or charms," in a mound near Melbourne, called Turkey Creek mound, reported by Mr. Clarence B. Moore in "Certain aboriginal mounds of the coast of South Carolina."[3]

Hernando County.—Cache of 24 implements, stemmed, shouldered, but not barbed (Division III, Class B), of white flint (chalcedony), found 2 feet below the surface at Brooksville, Hernando County, Florida, by J. J. Bell. (Cat. No. 170497, U.S.N.M.,

Volusia County.—Cache of ceremonial implements (banner stones?), found in a mound near Tomoka Creek.[4]

ALABAMA.

Blount County.—Cache of 17 chipped implements.[5]

KENTUCKY.

Boyd County.—Cache of 165 leaf-shaped (Division I, Class A) gray flint implements from Ashland. Average size 3¾ by 1⅝ inches by ⅜ of an inch. (E. J. Taylor, Cat. No. 150177, U.S.N.M.)

Todd County, Dycus farm, 3 miles east of Trenton.—Cache, number not given.[6]

Uniontown, Union County.—Cache of 140 hornstone knives. Two caches, number not given,[7] 6 miles above Caseyville.

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[1] What rite or ceremony does this indicate, or what kind of Indian medicine does it represent? T. W.

[2] Smithsonian Report, 1879, p. 381.

[3] Philadelphia, 1898, pp. 189–191.

[4] A. E. Douglas, Proceedings American Association for the Advancement of Science, XXI, 1872.

[5] Frank Burns, Smithsonian Report, 1882, p. 826.

[6] James D. Middleton in Cyrus Thomas's Catalogue, p. 99.

[7] Gerard Fowke, Thomas's Catalogue.

TENNESSEE.

Carter County.—John W. Emmert, of Bristol, Tennessee, reported May 4, 1892, a cache of leaf-shaped implements of quartzite from the bank of the Watauga River, Carter County, northwestern Tennessee, consisted of 18 pieces 6¼ to 9 inches in length, 3 to 3½ inches in width, and ⅝ to ⅞ of an inch in thickness. They were buried 2 feet below the surface, laid on the flat side, and arranged in a circle with the points to the center, the cache being about 2 feet in diameter. The hole in which they were deposited was dug through the soil and into the hard yellow clay. Nothing was found associated with them, although there was an aboriginal cemetery in the neighborhood. (Deposited by T. W., Cat. No. 150195, U. S. N. M.)

ARKANSAS.

Plate 61 represents 5 specimens out of a cache of 14, found on the banks of the Little Missouri River, Arkansas. They were deposited together, the edges overlapping, in a layer of hard yellow clay, on the terrace hillside back from the river bank, and were unassociated with other objects. They are of milk-white chalcedony, and are from 11 inches in length down. They are classified as Division III, Class C, stemmed, shouldered, and barbed. (Deposited by T. W., Cat. No. 150196, U. S. N. M.)

MISSOURI.

Near St. Louis.—"There are also a few cache finds, notably those large spades from 12 to 18 inches in length. We have a number of other cache finds, not so large in size, but equally fine in workmanship. * * * The spades and hoes come from near St. Louis, and are usually found in the vicinity of mounds. They comprise all the known forms, and many are polished on one end, which is probably caused by digging in the earth." (The Missouri Historical Society exhibit of St. Louis at the World's Columbian Exposition, Chicago, Illinois, under the direction of William J. Seever.)

Chariton County.—"Mr. John P. Jones, of Keytesville, Chariton County, Missouri, communicated to me some particulars of three deposits of flint implements brought to light in the neighborhood of his home. The first was a store of spearheads and arrowpoints, several hundreds in number, which he was too late to secure or satisfactorily examine. The weapons were all new, a fact conclusive that here had been the arsenal of a tribe or the secreted stock in trade of another primitive American merchant."

Better fortune attended Mr. Jones in the discovery of a second deposit, consisting of 17 new flint knives, as the greater number of them fell into his possession.

A third deposit described by Mr. Jones was discovered in the valley or "second bottom" of Chariton River, and contained about 50 small, flat, ovoid, pointed flints. "They had been stuck into the ground, point down, in concentric circles, and were then covered with earth, forming over them a low, flat mound 12 or 18 inches in height by 5 or 6 feet in diameter. * * * Some were gapped on the edges, and all were to a certain extent polished."[1]

OHIO.

Ross County.—Messrs. Squier and Davis,[2] during their survey of the earthworks of Ohio, opened a broad but low mound of "Clark's Works," in Ross County, of that State. They made an excavation 6 feet long and 4 feet wide, from which they took about 600 specimens of flint disks, en cache, placed in two layers edgewise. The deposit extended beyond the limits of their excavation on every side, and hence the actual number of specimens was not ascertained by them. The implements are described as ovoid or roundish, or terminating in a blunt point at one

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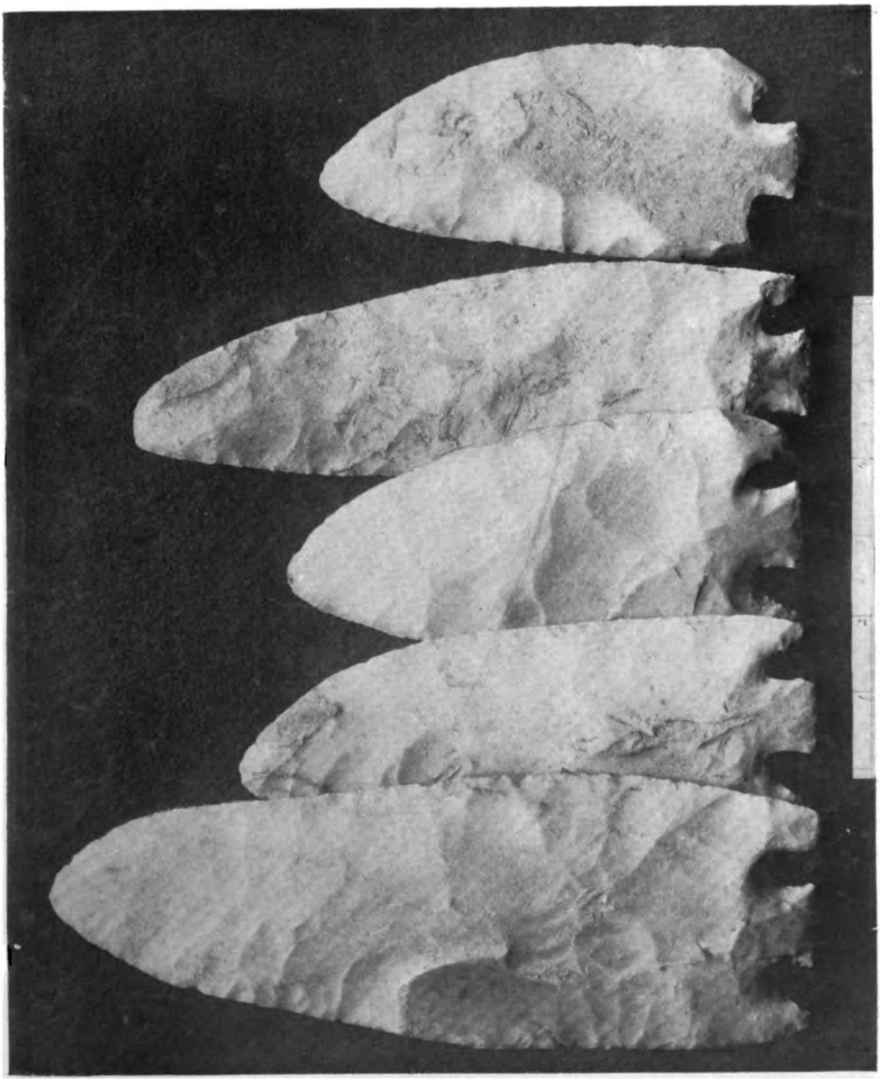
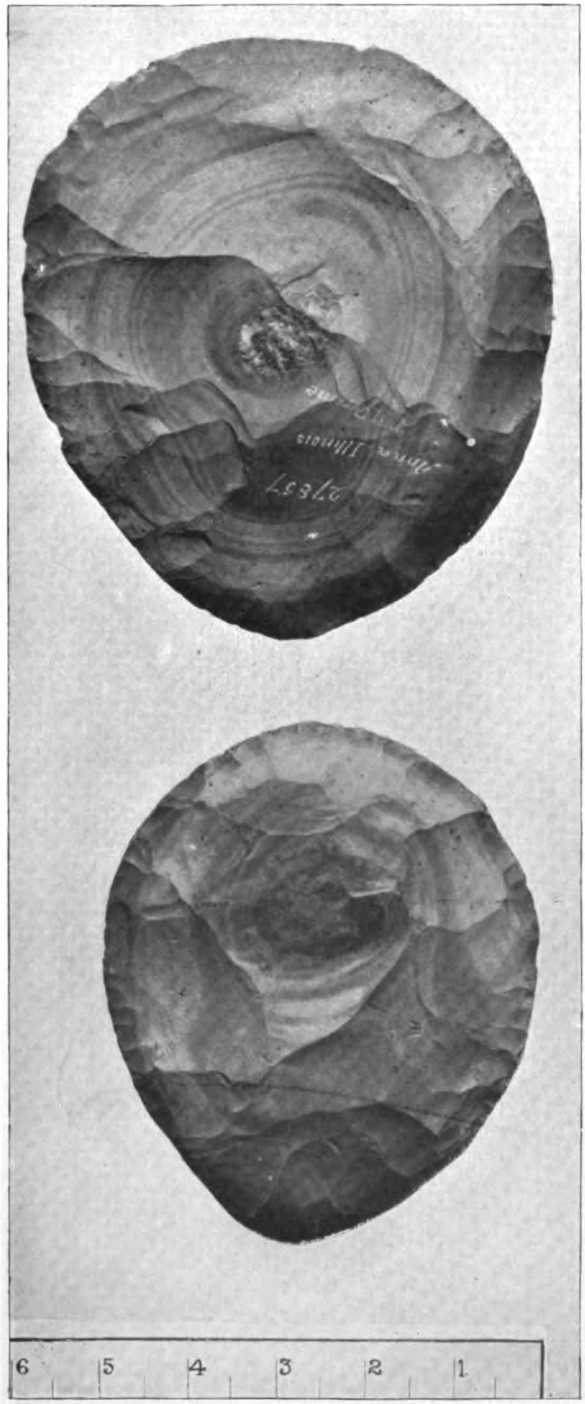
[1] J. P. Jones, J. F. Snyder, Smithsonian Report, 1876, p. 435.

[2] Ancient Monuments of the Mississippi Valley, pp. 158–214, pl. x.



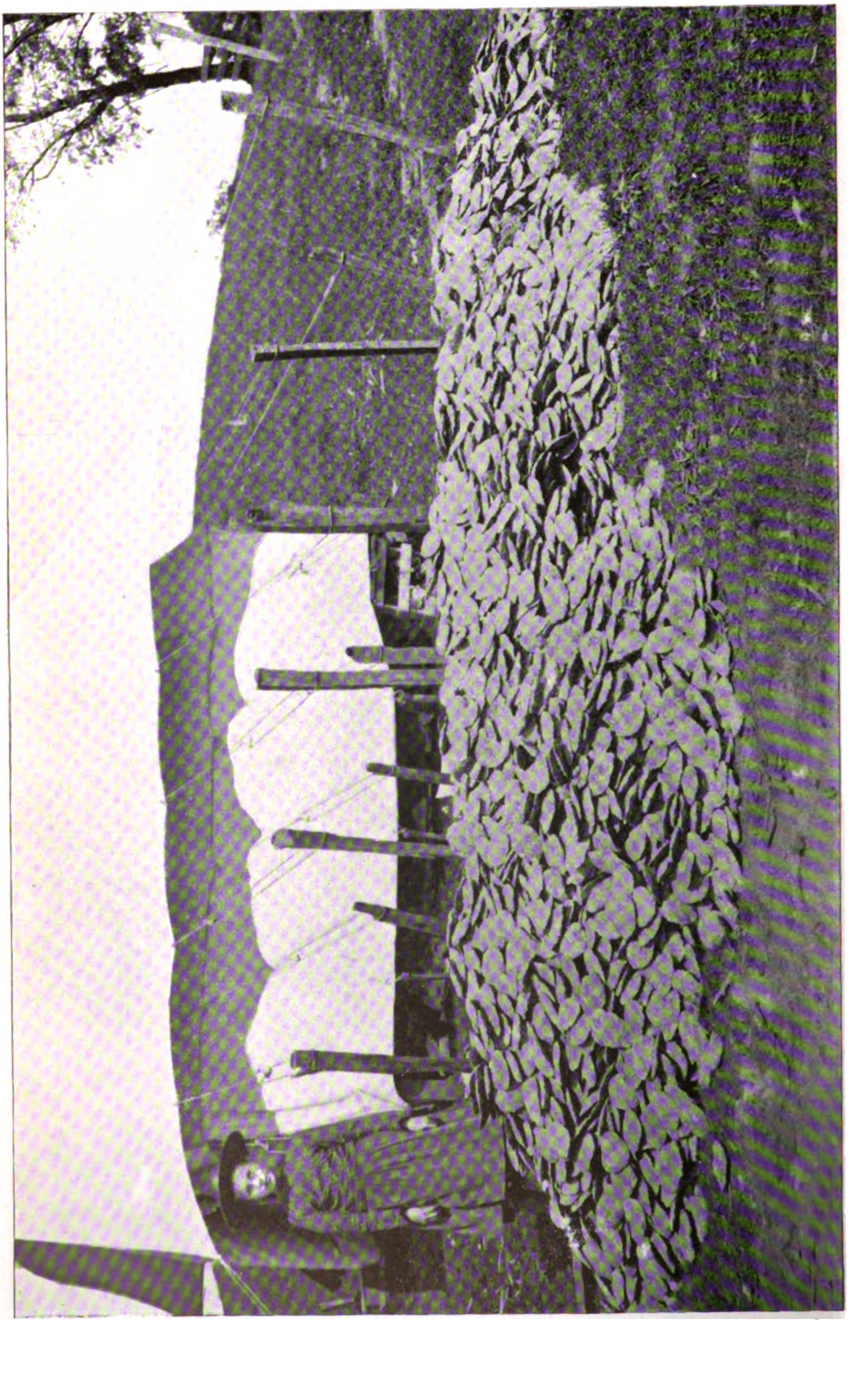
LARGE SPEARHEADS OF CHALCEDONY.
Little Missouri River, Arkansas.



FLINT DISKS MADE FROM CONCRETIONARY FLINT NODULES.

(Upper specimen) Illinois; (lower) Ohio.

Cat. Nos. 139924, 27587, U.S.N.M.



PILE OF 7,382 CHIPPED FLINT DISKS, CACHED IN MOUND 2, HOPEWELL FARM.

Anderson Station, Ross County, Ohio.

Prof. Warren K. Morehead, 1891.

PLATE 64.

LARGE SPEARHEADS OF CHALCEDONY.

College Corners, Ohio.

end. They were of various sizes, but on an average 6 inches long, 4 inches wide, and an inch thick in the center (Plate 62, fig. 1). Some were rudely blocked out; in others the circumference was chipped to a more or less defined edge. The material is flint or hornstone of fine texture, generally of a gray color, and showing sometimes concentric bands, in the center of which is a nucleus of blue chalcedony, thus demonstrating that the flint was formed in nodules and not in strata or layers.

In October, 1891, Prof. Warren K. Moorehead, while working for the Department (M) of Ethnology, World's Columbian Exposition, Chicago, continued the suspended excavations of Squier and Davis, and opened what he has described as Mound No. 2, on Hopewell farm, Anderson Township, Ross County, near Chillicothe. In three days' work Professor Moorehead took out 7382 of these flint disks. Others found in the immediate neighborhood increased this number to 8185.[1] Plate 63 is from a photograph of the tent, and in front of it are the flint disks as they were piled after being taken from the mound.

Summit County.—A cache of 197 leaf-shaped implements was found under the stump of a tamarack tree 3 miles west of Akron. Mr. Thomas Rhodes sent 5 of them to the U. S. National Museum, December, 1878 (Cat. Nos. 34584–34588, U.S.N.M.). They were from 5 to 7 inches long, 2¼ to 3 inches wide, and ¼ to ⅜ inch thick. Cat. No. 34584, No. 2, Plate 29, Class B, with rounded base, represents one of these specimens. Their fine chipping and exceeding thinness are to be remarked.

Buchtel College, Akron, exhibited at the Cincinnati Exposition of 1887 a cache of leaf-shaped implements similar in appearance to those found by Mr. Rhodes, whether part of the same is not known.

Scioto County.—Mr. Thomas Kinney, of Portsmouth, had 125 leaf-shaped implements belonging to a cache discovered in his neighborhood, which he exhibited at the Philadelphia Centennial Exposition.[2]

Lake County.—Colonel Whittlesey reported a cache of leaf-shaped implements found by Mr. J. C. Huntingdon near Painesville.[3]

Ashland County, Sullivan Township.—In 1872 Mr. S. W. Briggs discovered, while plowing, a cache of 201 implements about 18 inches beneath the surface. They were leaf-shaped, about 4 inches long, 2 to 2¾ inches wide and ⅜ inch thick. They were deposited in a keg-like vessel of the bark of the red elm, 10 or 12 inches in diameter and 13 inches in height. No signs of use.[4] Figs. 105 and 106 are specimens from this cache. As will be seen, both are thin, finely chipped, with rounded base and of the form of Class B.

Clarke County.—Cache of flint implements, number not given.[5]

Holmes County, Washington Township.—On the farm of Mr. Daniel Kick, 96 leaf-shaped implements of Class B. They were found in the alluvial deposit at the bottom of a pond, 3 feet beneath the surface. The U. S. National Museum possesses 2 of these specimens (Cat. Nos. 28345–46, U.S.N.M.) sent by Mr. H. B. Case. The average sizes were 2¾ to 5½ inches long, 1¾ to 2½ inches wide, and ¼ to ⅜ inch thick, very thin and finely chipped and of chalcedonic flint of the color of dirty beeswax.[6]

Butler County.—Prof. J. S. McFetridge, of College Corner, reports August 7, 1895, a cache of 7 beautiful white flint arrowpoints, more chalcedony than flint. They were all stemmed and shouldered, but not barbed (Division III, Class B), about 3¾ inches long and 1⅜ inches wide (Plate 64).

Putnam County.—Mr. Harry B. Maple, Columbus Grove, Ohio, under date of February 28, 1893, reports:

"Early this fall a farmer living about 2 miles west of town related that about seven years ago, he plowed into a nest of flints. I and a friend of mine went there

[1] Primitive Man in Ohio, p. 189.
[2] M. C. Read, American Antiquarian, I, 1879, p. 98.
[3] Idem.
[4] George W. Hill, Smithsonian Report, 1874, p. 364.
[5] Cyrus Thomas's Catalogue, p. 167.
[6] H. B. Case, Smithsonian Report, 1877, p. 267.

and dug them out. They were mostly in the clay about 2 feet deep. They nearly all consisted of a reddish material, although some were a light gray. I sent by mail to-day some samples of them."

These were duly received by the U. S. National Museum and are catalogued as No. 149611. The material appears as though from Flint Ridge. They were leaf-shaped (Division I, Class B).

Franklin County.—Cache on Wetmore farm, northwest one-half of section 2, township 1, range 18. Number not given.[1]

Montgomery County.—Two miles west of Centerville, on farm of Mr. W. Whitman. Cache of 640 leaf-shaped implements, Class B, rounded base. They were placed edge up and thus about two dozen were broken by the plow. The weight of the cache was 49 pounds.[2]

Columbiana County.—Mr. I. L. Kite, in a letter of February 25, 1878, published in the Cleveland Herald, describes a find near Damascus. "The deposit would fill a bushel basket. They were all placed on the broad end, enough set up to fill a certain circle, then another on top, and then another until a perfect cone was formed."

INDIANA.

Thirty miles south of Chicago.—Cache of 96 leaf-shaped implements pointed at both ends (Division I, Class A), from 8½ to 4 inches long, of dark grayish-brown jaspery flint, buried under a stump. Discovered and reported August 2, 1895, by Dr. Daniel B. Freeman, 4080 Drexel Boulevard, Chicago, Illinois.

Cache of 82 specimens found near Blue River by Mr. Ira Williams of Borden, Indiana. These are similar to the flints found by Dr. Snyder in Illinois and Professor Moorehead in Ohio, slightly pointed at both ends, made from similar nodules of black flint. The largest is about 6 inches long and 5 inches wide, while the smallest is about 3 inches long and 2 inches wide.

Franklin County.—Small caches of flint disks have been found, one cache containing 12, another 80 or 90 disks.[3]

ILLINOIS.

White and Jefferson counties.—"In the Smithsonian Report for 1876[4] is cited a remark of Messrs. Squier and Davis relating to the disks of black flint. There have been two deposits found in this country, one in the county south of us (White), and one in the county west (Jefferson). The first one contained 13 of them, of which I obtained 8, and the other contained 46, of which I obtained several."[5]

Jackson County.—A cache of 100 implements made from chert nodules found in calcareous rocks near Carbondale, Jackson County, Illinois. Size from 7 by 5¼ inches to 4 by 3½ inches. Donated by Mr. John G. Sims; collected by Mr. J. D. Middleton. Cat. No. 88451, U.S.N.M.

Union County.—Eight hornstone disks, large, from Union County, Illinois. T. M. Perrine, Cat. Nos. 27853-27860, U.S.N.M. (Plate 62, fig. 2).

Schuyler County.—A few years ago, at Bluff City, Illinois, some hogs confined in a pen at the foot of the bluffs rooted out of the ground a deposit of 16 polished-stone axes, all of which bore marks of use. They were of hard, compact diorite, and varied in size from 6 to 16 inches in length, and from 2 to 7 inches in width. Considering the probable uses to which these tools had been applied, and the location of the deposit, in a spur of the bluff near the (Illinois) river, it was plain that here, in ages past, a canoe had been constructed. The work completed, the tools were cached at the foot of the bluff, until they should again be needed for similar work.[6]

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[1] Thomas's Catalogue, p. 171.

[2] S. H. Binkley, American Antiquarian, III, 1881, p. 144.

[3] Edgar R. Quick, Smithsonian Report, 1879, p. 373.

[4] Page 436.

[5] H. F. Sibley, Smithsonian Report, 1881, p. 589.

[6] J. F. Snyder, Smithsonian Report, 1876, p. 434.

In the year 1860 a similar deposit of hornstone was discovered in this vicinity, in the town of Frederickville, Schuyler County, on the west side of the Illinois River. This locality was a favorite abiding place of the Indians and the center of a dense population. Relics of their work are still found in abundance throughout this region. A small ravine near the foot of a bluff, one day after a heavy rain, caved in on one side, and the displacement of a large quantity of earth in consequence exposed to view a few strange-looking flints. They had been buried about 5 feet below the surface of the hillside, laid together on edge, side by side in long rows, forming a single layer of unknown extent. The discovery of such novel objects attracted some of the villagers to the place, who dug out about 3,500 of the unique implements, and, their curiosity satisfied, abandoned the work without reaching the limits of the deposit. * * * The stone of which these disks are made is a dark, glossy hornstone, undistinguishable from the disks of the sacrificial mound in Ohio.[1]

Carroll County.—In the town of York, on section 7, is a deposit of flint chippings. On the top of a high sand ridge, for a space of a mile long and half a mile wide, flint chippings are exposed. In some places they occur in masses of a peck or half a bushel; in other places they whiten the ground for yards. The material is a cream-colored chert, breaking with a smooth conchoidal fracture. It was all brought there, as no stone is found in situ in the whole ridge. Here was a great manufactory of arrowpoints and other flint implements. Pieces of arrowpoints and fragments of the flint in all stages of manufacture strew the ground. Perfect arrowpoints are sometimes found in clusters. Twenty-six were recently picked up in one nest—rough, but well-nigh finished.[2]

Cass County.—"In the spring of 1880, Mr. George W. Davis, farmer in Monroe precinct, Cass County, Illinois, 10 miles east of the Illinois River, while plowing, observed a few sharp-pointed flints, and found that they formed part of a deposit of 32 small implements which had been carefully placed in the ground on edge, side by side, with their points toward the north. They seem to have been buried. With one exception they are of a cherty, muddy-looking siliceous stone, of a grayish color streaked with white; a flinty formation occurring in all lead-bearing strata of Illinois, and identical with the cherty nodules and seams in the subcarboniferous outcrops of the upper Mississippi and southwestern Missouri. They had been buried new, showing no marks of use, and their peculiar style of workmanship and similarity of design leave little doubt that they are the product of the same artisan. The exceptional one in the deposit is a well-proportioned and perfect spearhead nearly 3 inches in length, neatly chipped, of opaque milk-white flint, strongly contrasting in material, shape, and finish with the others, and evidently manufactured by some other hand, perhaps in a different and remote workshop. Fourteen of the lot are laurel-leaf or lanceolate pattern, pointed at one end and rounded at the other, with edges equally curved from base to point, averaging three-eighths of an inch in thickness in the middle and evenly chipped to a cutting edge all around. They are uniform in shape, but differ in size; the smallest measuring 2¾ inches in length by 1¼ inches in width at the center; and the largest one 6 inches long and nearly 2 inches wide. They are of a type common in all parts of the Mississippi Valley, and are supposed to have been used as knives or ordinary cutting tools. The remaining 18 are shaped alike, differ in size, but are of the same average thickness. They, too, are sharp-pointed at one end, but in outline from base to point their sides are unequally convex, one being slightly curved and the other curved but little from a straight line, giving them an ungainly and lopsided form. Their broad ends, originally rounded, probably like the first 14, have been chipped away on each side for a half or three-fourths of an inch from the extremity, forming a broad, rudimentary shank. (See Chap. IX, p. 946.)

[1] J. F. Snyder, Smithsonian Report, 1876, p. 437.

[2] James Shaw, Smithsonian Report, 1877, pp. 256, 257.

A deposit of flints was turned up by the plow, on March 28, 1882, on the southern border of Cass County, 26 miles east of the Illinois River. Its location was on the brow of the hills overlooking Indian Creek to the south. In this cache were 35 elegant flint implements entirely different in form, material, and finish, from those before described. Their position in the ground was vertical and closely packed together, but otherwise without any peculiar arrangement. The 35 beautiful flints of this Indian Creek deposit are the perfection of ancient stone-chipping art. In form they are of the broad or lilac-leaf pattern, pointed more or less obtusely at one end and regularly semicircular at the other; the length but little exceeding the width; scarcely more than three-eighths of an inch thick, they are smoothly chipped to an even, sharp edge all around. They vary a little in size and somewhat in proportions; the smallest of them is 3¼ inches long by 2⅝ inches broad at the base, and the largest one measures 5 inches in length and 3½ inches across the widest part. Six of them are made of mottled red and brown glossy jasper, and the remaining 29 of ordinary white flint shading in texture from the compact translucent glassy to the opaque milk-white varieties. The rounded edge of each is smooth and worn, and the sides of some are gapped, testifying to long and hard usage before their interment, and indicating conclusively that the broad circular edge of the tool was the one chiefly used.[1]

In the summer of 1872 I received intelligence that a deposit of the same sort of flints had been found at Beardstown (Cass County). In excavating a cellar for a new building on Main street, the laborers had reached the depth of 4 feet when they struck the flints, and soon threw them all out (about a thousand in number), a large portion of which I secured. The disposition of the flints in this deposit was different from that in the Ohio mound, and that of the Frederickville deposit also. These were embedded in the bank of the river, above the reach of highest water, and about 300 yards up the bank of the stream from the large mound. An excavation about 5 feet deep had been made through the sand to the drift clay, and, instead of being placed on edge, as in the two other deposits, a layer of the disks had been placed flat on the clay, with points upstream, and overlapping each other as shingles are arranged on a roof. Over the first layer of flints was a stratum of clay 2 inches in thickness; then another layer of flints was arranged as the first, over which was spread another 2-inch stratum of clay, and so on, until the deposit comprised five series or layers of flints, when the whole was covered with sand. The area occupied by these buried flints measured in length about 6 feet, and in width 4 feet. * * * No traces of fire were visible, nor had there been within the recollection of the oldest settler of the place any mound or other external object to mark the place of deposit. The flints of this lot are identical in material, color, style of execution, and general outline and dimensions with those I have seen from deposits at Frederickville and Clark's Works in Ohio. A few of them are almost circular in shape. Some are rough, but the majority are very accurately proportioned and neatly finished, which we may accept as proof that the implements were manufactured by several artisans who possessed unequal degrees of skill. Their average length is 6 inches, their width 4 inches, and they are three-fourths of an inch thick in the middle. Their average weight is 1¼ pounds. * * * They were all made from globular or oval nodules of black or dark-gray hornstone, which were first split open and each part again split or worked down by chipping to the shape and size required. In several of the specimens the first fracture of the nodule forms the side of the implement, with but slight modification beyond a little trimming of the edges. Many of them retain in the center the nucleus around which the siliceous atoms agglomerated to form the nodule. In a few the nucleus is a rough piece of limestone; in others it consists of fragments of beautifully crystallized chalcedony, surrounded by regular light and dark circles of eccentric accretion

[1] J. F. Snyder, Smithsonian Report, 1881, pp. 564-568.

[see Plate 62], and the exterior of the rock was incrusted with a compact, drab-colored calcareo-siliceous coating of half an inch in thickness, which in some of the specimens has not been entirely removed. Nearly all the Beardstown disks were roughened and discolored with patches of calcareous concretion almost as hard and solid as the flint itself, indicative of undisturbed repose in their clay envelopes for a great period of time."[1]

Lake County.—Cache of 12 specimens.[2]

Schuyler County.—Two barrels of specimens.[3]

Peoria County, Millbrook Township.—Cache, number unknown.[4]

St. Clair County.—"The finest Indian mound in the State of Illinois is situated 3 miles northeast of the town of Lebanon, in St. Clair County, not far from the western border of Looking-glass Prairie. In shape it is a truncated pyramid, or rather a parallelogram, measuring at its base 400 feet in length and 250 feet in width, and rising in perfect proportions to the height of 50 feet. The angles are still sharp and well defined and the top level, comprising (approximately) an area of 80 by 150 feet, which doubtless served as the base of some elaborate wooden structure. In the summer of 1843 the proprietor of the land, Mr. Baldwin, in sinking a well near one corner of the mound, found, a few feet below the surface, packed closely together, 18 large flint spades. These implements were broad, flat pieces of white or grayish white flint, measuring, the smallest 9 inches in length by 5 inches in width, the largest 15 by 7 inches. They are nearly an inch in thickness in the middle, neatly chipped to an edge all around, flat on one side and slightly convex on the other. One end of each flint is broader than the other, and the broad end is symmetrically rounded, and polished as smooth as glass by long-continued use in sandy soil. The narrow end is rough and not so neatly finished, showing no marks of wear, and was, in all probability, when the implement was in use, fastened in some sort of handle. It can not be doubted that these flints were in part the tools used in making the mound, and when the great work was finished they were stored away in the ground until again needed.[5]"

"In the early part of December, 1868, some laborers, while engaged in grading an extension of Sixth street, in East St. Louis, came upon a deposit of Indian relics, * * * flint tools, all of the hoe and shovel type, and * * * close by were found several bowlders of flint and greenstone, weighing from 15 to 30 pounds each, and many fragments of flint. The deposit was covered with from 18 to 24 inches of black earth. * * * The implements formed a "nest" by themselves, and instead of being packed close together were arranged with some regularity, overlapping each other or standing edgewise and covering a circular space. The whole deposit did not extend more than 7 or 8 feet on either side. The contractor neglected to count the implements, but he thinks there were from 70 to 75 in all—some 50 hoes and about 20 shovels. No other stone articles, such as arrow and spear heads, tomahawks, etc., had been deposited with the agricultural implements.[6]"

"In the summer of 1869 some children amusing themselves near the barn on the farm of Mr. Oliver H. Mullen, in the neighborhood of Fayetteville, St. Clair County, dug into the ground and discovered a deposit of 52 disk-shaped flint implements, which lay closely heaped together.[7]"

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[1] J. F. Snyder, Smithsonian Report, 1876, pp. 438, 439.

[2] Foster's Prehistoric Races of the United States of America, p. 209

[3] George Trauman, Smithsonian Report, 1879, p. 435.

[4] Cyrus Thomas's Catalogue, p. 63.

[5] J. F. Snyder, Smithsonian Report, 1876, p. 434.

[6] Charles Rau, Smithsonian Report, 1868, pp. 402, 403.

[7] Idem., 1872, p. 402.

MICHIGAN.

Saginaw Valley.—Nine caches of arrow and spearheads were reported by Mr. Harlan I. Smith, of Saginaw East Side, before Section H of the American Association.[1] They were all chipped blades of chert, believed to have been made from nodules of the Subcarboniferous period, which outcrops in a circular line in Saginaw Bay near Bayport. They are as follows:

No. 3. Frazier cache No. 1, 300 pieces. (1) Large black leaf-shaped implements 8 inches long with delicate stem at tip of base (turkey tail); (2) similar implements about 3 inches long; (3) small, yellow chert, leaf-shaped; (4) a few of the same, notched. Six miles from Saginaw, on the Tittabawassee River.

No. 4. Frazier cache No. 2, one large black leaf-shaped implement similar to those in cache No. 1, surrounded by 13 rubbed stones. A few feet from Frazier cache No. 1, about 1 foot deep.

No. 5. Merrill cache, 100 pieces, 1 foot depth.

No. 6. Cass cache No. 1, 70 pieces; leaf-shaped, 2 inches long, of dark-blue color, and different from the chert found in the other caches. Eight inches in depth, south bank of Cass River and 3 miles above Bridgeport.

Cass cache No. 2, 22 pieces and 12 nodules, with abundance of chips and flakes. South side of Cass River, 4 miles below Saginaw.

No. 8. Willie cache; 175 chipped blades, triangular, 1½ inches long. North bank of Cass River, 3 miles above Saginaw.

No. 9. Bayport cache; 47 pieces, rude leaf-shaped, laid in a roll overlapping each other, reminding one of shingles on a roof. Two feet depth.

By letter of August 10, 1894, Mr. Smith reports the extension of his discoveries to include 14 caches.

South Saginaw.—Mr. E. S. Golson, in letters of February 16 and May 9, 1892, describes two caches he found at or near his home at Green Point. One was found April 26, 1890, and consisted of 83 rude and thick leaf-shaped implements of "Bayport" stone on the "west bank of the Tittahawassee River at its mouth, about one-half mile from the mounds at Green Point." They were buried about 4½ feet under the surface and were placed together in a hole a foot or more in depth and width. These were sent by him to Peabody Museum. He found his second cache on the day he wrote his last letter. The specimens, 58 in number, were smaller than those in the former. They were of three sizes; all were leaf-shaped except one stemmed. None were deeper than 18 inches, and they had probably been disturbed by the plow, as they were not arranged with any system, but were scattered over a space of 6 feet square. They were all of the same size.

WISCONSIN.

Racine County.—"Some workmen, in digging a ditch through a peat swamp near Racine, found a deposit of disks of hornstone, about 30 in number. They lay on the clay at the bottom of the peat about 2½ feet below the surface. Some of the disks were quite regular; they vary from half a pound to a pound in weight."[2]

Dane County.—Cache of 300 leaf-shaped (Division I, Class A) implements of porphyritic felsite, found in Madison, Dane County, Wisconsin, by Mr. A. R. Crittenden. (Cat. No. 34255, U.S.N.M.)

Kewanee district trail.—Cache of 42 copper implements. Twenty-five of these were found at one time and described by the person who discovered them (a squaw) as a large green stone which she kicked and it fell apart, and upon picking it up she found about 25 different specimens. In going over the ground at the same spot

[1] Proceedings, XLII, 1893, p. 300. Madison, Wisconsin.

[2] Dr. Hoy, I. A. Lapham, Antiquities of Wisconsin, p. 8.

a year or two later 17 more implements were found, and near at hand were a group of polished-stone hatchets, one very large maul with center grooved, and a half dozen flint arrowpoints, the whole having been looked upon since as a cache, and are considered by the present owner, Mr. Wyman, as a kit of ancient mining tools left on the trail from the Kewanee district. Silver is plainly discernible in many of the objects of the native copper.

Calumet County—A cache of 22 leaf-shaped flint implements averaging from 2 to 2½ inches in width and 4 inches in length and standing on edge was found under a stump in Calumet County. A cache of 5 leaf-shaped implements was found near Kachena. Another cache of 7 arrowpoints from near New Holstein. Nearly all of the arrowpoints and spearheads are of quartzite, varying from the light-colored material to that of a dark maple-sugar color, and in size from 1¼ to 9½ inches. Mr. Hayssen has found a ledge of this quartzite near Black River Falls, where a large workshop is plainly indicated. (Hayssen Collection, NewHolstein, Wisconsin.)

MINNESOTA.

Mower County—Mr. Thomas B. Smith, of Rose Creek, October 8, 1895, reports that he has found in a cache on his farm 48 arrowpoints.

OREGON.

Rev. M. Eells, a veteran archæologist of Oregon,[1] speaking of stone spearheads and arrowpoints in that country, says "they were scarce, never having been made in modern times, but belonging only to ancient times. At Oregon City, about half a mile below the falls, is a perfect mine of them which had been unearthed by high water. A workshop was at the Umatilla landing, where Mrs. Kunzie has obtained many, some as beautiful as can be made. The chips are now seen all around, though the stone of which they were made—much the same as that used at Oregon City—must have been brought long distances."

[1] Stone Age of Oregon, Smithsonian Report, 1886, p. 289.

APPENDIX C.[1]

LARGE IMPLEMENTS OF ARROWPOINT OR SPEARHEAD FORM.

There are certain implements found throughout the United States, more especially the western and southwestern, which, except for their immense size, are identical in form with certain spear and arrow heads. An implement 2 or 3 inches in length will be recognized as an arrowpoint; if 5 or 6 inches in length it might be a javelin, lance, or spear; but when we encounter one, however correct it may be as to form, or fine as to workmanship, which is 10 inches or a foot in length, then what shall we call it and how shall we define its use? The U. S. National Museum possesses many of these specimens. Some of them have been found in cache, some in mounds and burial places, others sporadically, on the surface. Their great size and weight, while it does not absolutely interdict their attachment to a shaft or handle, nor their use as a weapon, render both extremely unlikely, or they might have been used ceremonially. But we are absolutely without other knowledge as to their use or purposes than that furnished by the implements themselves and their associations.

George F. Arvedson, of Carpentersville, Illinois, reported the finding of an implement of white flint or chalcedony of the form of a spearhead, stemmed and shouldered, not barbed (Division III, Class B) 15 inches long, 2¾ inches wide and ⅝ inch thick.

C. D. Williams, of Gainesville, Florida, reports having found in southwestern Georgia an implement of spearhead form (Division III, Class C) stemmed, shouldered, and barbed, of gray flint, 14¼ by 4½ inches by 1 inch.

Messrs. M. H. Spillman and E. B. Sumner, of Painesville, Lake County, Ohio, report the discovery, while digging in a mound near that town, of an implement of white flint or chalcedony, shouldered, stemmed, and barbed (Division III, Class C) 12¼ inches long, 3½ inches wide, and ¾ inch thick.

The following are representative large-sized spear and arrow heads in the U. S. National Museum:

One from West Derby, Vermont (Cat. No. 8922, U.S.N.M.) 11½ by 2¾ inches by ⅝ inch, of reddish iron-clay slate, leaf-shaped (Division I, Class B), reported by J. M. Currier and R. Wheeler.

Cat. No. 8923, U.S.N.M., from West Derby, Vermont, of reddish iron-clay slate, 11¾ by 1 15/16 inches by ⅝ inch, leaf-shaped (Division I, Class B), reported by H. W. Norris and J. M. Currier.

Cat. No. 98341, U.S.N.M., from a mound at Prairie du Chien, Crawford County, Wisconsin, of chalcedony, 11 by 2⅛ inches by ⅝ inch, leaf-shaped (Division I, Class B). Mound excavated by J. W. Emmert, of the Bureau of Ethnology.

Cat. No. 115501, U.S.N.M., from mound in Prairie du Chien, Crawford County,

[1] See p. 872.

SPEARHEAD OF WHITE FLINT.
Length, 15 inches.
Carpentersville, Illinois.

Wisconsin; obsidian, $7\frac{3}{4}$ by $2\frac{3}{4}$ inches by $\frac{3}{4}$ inch, stemmed, shouldered, and barbed (Division III, Class C). Mound excavated by J. W. Emmert, of the Bureau of Ethnology.

Cat. No. 150196, U.S.N.M., found en cache in the valley of the Little Missouri River, southwest Arkansas; chalcedony. There were 14 implements, all of white flint or chalcedony, of spearhead form, stemmed, shouldered, and barbed (Division III, Class C). They varied in size from $9\frac{1}{4}$ by $3\frac{3}{8}$ inches by $\frac{3}{4}$ inch down to $6\frac{1}{4}$ by $2\frac{5}{8}$ inches by $\frac{1}{2}$ inch. Collection T. W. (Plate 61.) There are in the U. S. National Museum 3 other specimens similar in size, form, and material, reported from Shreveport, Louisiana, by Mr. Hotchkiss.

Cat. No. 150195, U.S.N.M., represents a cache of leaf-shaped implements from the bank of the Watanga River, Carter County, northwest Tennessee. They were leaf-shaped in form (Division I, Class B), were of quartzite, 18 in number, their size varying from $9\frac{1}{8}$ by $3\frac{9}{16}$ inches by three-fourths of an inch to $7\frac{13}{16}$ by $3\frac{3}{16}$ inches by $\frac{3}{4}$ inch. Collection T. W.

Cat. No. 88112, U.S.N.M., from Middleton, Wisconsin; fine-grained, sparkling quartzite, light-gray color, spearhead form, stemmed, shouldered, and barbed (Division III, Class C), $8\frac{1}{4}$ by $3\frac{1}{8}$ inches by $\frac{1}{4}$ inch. Collection of Bureau of Ethnology. See also figs. 170, 171, 172, pp. 924–926.

Cat. No. 88335, U.S.N.M., from Middleton, Wisconsin, of fine-grained quartzite, dark color, nearly black, spearhead form, stemmed, shouldered, and barbed (Division III, Class C), $8\frac{7}{8}$ by $2\frac{3}{4}$ inches by $\frac{1}{2}$ inch. Collection of Bureau of Ethnology.

Cat. No. 150179, U.S.N.M., from Ashland, Kentucky, of brown chert, spearhead form, stemmed and shouldered but not barbed (Division III, Class B), $8\frac{1}{2}$ by $2\frac{15}{16}$ inches by $\frac{5}{8}$ inch. Obtained from E. J. Taylor.

Cat. No. 88105, U.S.N.M., from Wisconsin, of brown lustrous pyromachic flint, spearhead form, stemmed and shouldered, not barbed (Division III, Class B), $6\frac{3}{8}$ by $2\frac{7}{16}$ inches by $\frac{5}{8}$ inch. Collection of Bureau of Ethnology.

Reference is made to the 95 implements in the cache reported by Mr. Edward Ingram from Chester County, Pennsylvania, and figured in Plate 59; also to sundry large specimens described and figured in other parts of this paper.

Dr. Abbott,[1] speaking of these large spearheads and referring to Schoolcraft, makes mention of an Indian chief presenting to him one 7 inches long and declaring it to be an implement belonging to his ancestors, and says:

> It is not a little strange that the early writers, who refer to the Indians before they had wholly discarded stone implements, or very soon afterwards, should so generally have overlooked this form, while they frequently mention their axes and arrowpoints. Neither Holm nor Kalm refer to the large spearheads as weapons of the Delaware Indians, or refer to the use of the spear or lance, in describing their methods of warfare; yet the number of these objects found is of itself sufficient to indicate that at one time they were in very common use. Is it probable that they had been discarded in great measure at some remote period and were veritable relics of a distant past when the European settlers first reached our shores? The absence of direct reference to these characteristic implements seems indicative of this.

This raises an exceedingly interesting question. Whatever may have been the purpose, and when or by whomsoever made, may they not have been themselves prehistoric to the aborigines at the time of the discovery of the continent? Are they to be classed with the so-called ceremonial objects, banner-stones, bird and boat shaped articles, and with tubes, plummets, sinkers, or charms, not only the uses or purposes

[1] Primitive Industry, p. 248.

of which are unknown to our modern Indian, but even the races or peoples by whom they were made; all of which gives rise to numberless speculations?

There are certain other large stone implements of leaf-shaped form resembling Class B, and from description and drawing might be assigned to it. These are the so-called hoes or agricultural implements. Their locality is extensive, but nevertheless, is limited to the interior, say from Ohio to Georgia, and from the Virginia mountains to the western Mississippi Valley. The implements are large, being from 6 to 16 inches in length, with corresponding width and thickness. They are of quartzite, novaculite, chert, and similar material, and are always chipped. Although resembling in form the ordinary leaf-shaped implement, they have no other or further relation to it. While they are more or less pointed at both ends, yet they are not sufficiently so for thrusting or piercing, and were evidently never intended for such purposes. They may have been inserted in a handle, though no traces of it have ever been found, or they may have been held in the hands. An inspection shows them to have been used as an implement for digging in the earth. The point is frequently worn smooth and dull for several inches up the blade, showing striæ and even notches, the result of friction in the earth by digging.

These implements are sometimes found en cache. The collection of the Missouri Historical Society displayed at the World's Fair held in Chicago, in 1893, under the direction of Mr. William J. Seever, contained many of these implements, chiefly from the neighborhood of St. Louis, some of which were from caches. See Appendix A (quarries), Illinois, p. 966, and Appendix B (caches), p. 974.

APPENDIX D.[1]

MAKING OF ARROWPOINTS DESCRIBED BY EXPLORERS AND TRAVELERS.

Catlin[2] thus describes the Apache mode of making flint arrowpoints:

Like most of the tribes west of and in the Rocky Mountains they manufacture the blades of their spears and points for their arrows of flints, and also of obsidian, which is scattered over those volcanic regions west of the mountains; and, like other tribes, they guard as a profound secret the mode by which the flints and obsidian are broken into the shapes they require. * * *

Every tribe has its factory in which these arrowheads are made, and in those only certain adepts are able or allowed to make them for the use of the tribe. Erratic bowlders of flint are collected (and sometimes brought an immense distance) and broken with a sort of sledge hammer made of a rounded pebble of hornstone set in a twisted withe, holding the stone and forming a handle. * * * The master workman, seated on the ground, lays one of these flakes on the palm of his left hand, holding it firmly down with two or more fingers of the same hand, and with his right hand, between the thumb and two forefingers, places his chisel (or punch) on the point that is to be broken off; and a cooperator (a striker) sitting in front of him, with a mallet of very hard wood, strikes the chisel (or punch) on the upper end, flaking the flint off on the under side, below each projecting point that is struck. The flint is then turned and chipped in the same manner from the opposite side; and so turned and chipped until the required shape and dimensions are obtained, all fractures being made on the palm of the hand.

In selecting a flake for the arrowhead a nice judgment must be used, or the attempt will fail. A flake with two opposite parallel, or nearly parallel, planes is found, and of the thickness required for the center of the arrowpoint. The first chipping reaches near to the center of these planes, but without quite breaking it away, and each chipping is shorter and shorter, until the shape and the edge of the arrowpoint are formed.

The yielding elasticity of the palm of the hand enables the chip to come off without breaking the body of the flint, which would be the case if they were broken on a hard substance. These people have no metallic instruments to work with, and the instrument (punch) which they use I was told was a piece of bone; but on examining it I found it to be a substance much harder, made of the tooth (incisor) of the sperm whale or sea lion, which are often stranded on the coast of the Pacific. This punch is about 6 or 7 inches in length and 1 inch in diameter, with one rounded side and two plane sides, therefore presenting one acute and two obtuse angles to suit the points to be broken.

This operation is very curious, both the holder and the striker singing, and the strokes of the mallet given exactly in time with the music, and with a sharp and rebounding blow, in which, the Indians tell us, is the great medicine (or mystery) of the operation.

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[1] See p. 884.

[2] Last Rambles amongst the Indians, pp. 187–90.

To Catlin's description Mr. Stevens[1] makes the following approving criticism:

What Catlin has said with regard to a rebounding blow is perfectly true; it is impossible to flake flint with a dull, heavy, smashing blow; it is the measured and rebounding blow—a shock rather than a blow—which, given with judgment, enables the material to take its own line of cleavage, and produces what is so well known as the conchoidal fracture, resulting from human skill, that distinguishes the mere splinter of flint from the flint flake; and it is the repetition of this operation twenty or thirty times around the edges of those flint implements found in the drift that stamps them as proofs of human handiwork.

Admiral Sir E. Belcher[2] gives an account of the manufacture of flint arrowpoints by the western Eskimo tribes at and north of Icy Cape, as follows:

But to the process which they pursue in effecting the fine, regular, serrated edges of their flint arrowheads.

Possibly, had I not witnessed the operation and had been at the time one of the first Europeans with whom they ever had communication, the idea would have remained undisputed that they owed their formation to the stroke of the hammer. Being a working amateur mechanic myself, and having practiced in a very similar manner on glass with a penny piece in 1815, I was not at all surprised at witnessing the modus operandi. Selecting a log of wood in which a spoon-shaped cavity was cut, they placed the splinter to be worked over it, and by pressing gently along the margin vertically, first on one side and then on the other, as one would set a saw, they splintered off alternate fragments until the object thus properly outlined presented the spear or arrowhead form, with two cutting serrated edges.

But let us revert to this instrument for the use of which the untaught would never imagine a purpose, and which, I suspect, was not witnessed or deemed worthy of notice by any other individual of the expedition.

First, this instrument has a graceful outline. The handle is of fine fossil ivory. That would be too soft to deal with the flint or chert in the manner required. But they discovered that the point of the deer horn is harder and also more stubborn; therefore, in a slit, like lead in our pencils, they introduced a slip of this substance and secured it by a strong thong, put on wet, but which on drying became very rigid. Here we can not fail to trace ingenuity, ability, and a view to ornament. It is the point of the deer horn which, refusing to yield, drives off the fine conchoidal splinters from the chert. [See figs. 68–74].

I can not here omit remarking that the very same process is pursued by the Indians of Mexican origin in California with the obsidian points for their arrows; and also in the North and South Pacific—at Sandwich Islands (21° north), and Tahiti (18° south)—39 degrees or 2,340 miles asunder—similar indentations or chippings are carried out in forming their axes from basaltic lava, but probably performed in the latter instances with stone hammers. I myself witnessed at the convent of Monterey the captured Indians forming their arrowheads out of obsidian similarly to the mode practiced by the Eskimos.

Schoolcraft[3] thus describes the mode of making flint arrowpoints by the North American Indians:

The skill displayed in this art, as it is by the tribes of the entire continent, has excited admiration. The material employed is generally some form of hornstone,

[1] Flint Chips, pp. 83, 84.
[2] Transactions of the American Ethnological Society, new ser., I, Pt. 2, 1861, p. 138.
[3] North American Indian Tribes, III, p. 467.

sometimes passing into flint. This mineral is often called chert by the English mineralogists. No specimens have, however, been observed where the substance is gunflint. This hornstone is less hard than common quartz, and can readily be broken by contact with the latter. Experience has taught the Indian that some varieties of hornstone are less easily and regularly fractured than others, and that the tendency to a conchoidal fracture is to be relied on in the softer varieties. It has also shown him that the weathered or surface fragments are harder and less manageable than those quarried from the rocks and mountains.

To break them, he seats himself on the ground, and holds the lump on one of his thighs, interposing some hard substance below it. When the blow is given, there is a sufficient yielding in the piece to be fractured not to endanger its being shivered into fragments. Many are, however, lost. After the lump has been broken transversely it requires great skill and patience to chip the edges. Such is the art required in this business, both in selecting and fracturing the stones, that it is found to be the employment of particular men, generally old men, who are laid aside from hunting, to make arrow and spear heads.

The modern manufacture of obsidian arrowpoints by the Indians of California is thus described by an eyewitness:[1]

The Indian seated himself on the floor and, laying the stone anvil upon his knee, with one blow of his agate chisel he separated the obsidian pebble into two parts; then giving a blow to the fractured side he split off a slab a quarter of an inch in thickness. Holding the piece against his anvil with the thumb and finger of his left hand, he commenced a series of continuous blows, every one of which chipped off fragments of the brittle substance. It gradually seemed to acquire shape. After finishing the base of the arrowhead (the whole being little over an inch in length) he began by striking gentle blows, every one of which I expected would break it into pieces. Yet such was his adroit application, his skill, and dexterity, that in little over an hour he produced a perfect obsidian arrowhead.

I then requested him to carve one from the remains of a broken bottle, which, after two failures, he succeeded in doing. He gave as a reason for his ill success that he did not understand the grain of the glass. No sculptor ever handled a chisel with greater precision, or more carefully measured the weight and effect of every blow, than did this ingenious Indian; for even among them arrow making is a distinct profession, in which few attain excellence. In a moment all I had read of the hardening of copper for the working of flint axes, etc., vanished before the simplest mechanical process.

Mr. T. R. Peale of the scientific corps of the United States Exploring Expedition, witnessed the making of arrowpoints among the Shasta and northern California Indians. He says that the flakes were struck off from the mass of jasper, agate, or chalcedony, by a blow with a round-faced stone, and that the edges were chipped by the application of a notch in a piece of horn, as a glazier chips glass. The notches in the horn tool were of different size and depths, in order to suit the work to be done.[2]

Every American collector, as well as archæologist, has read John Smith's description of the making of arrowpoints by the Virginia Indians.[3]

His arrowhead he quickly maketh with a little bone, which he ever weareth at his bracer, of a splint of a stone or glasse in the form of a heart, and these they glew to the end of their arrowes.

[1] Stevens, Flint Chips, pp. 77, 78. [2] Idem., p. 78. [3] Sixth Voyage, 1606.

Torquemada[1] says:

They had, and still have, workmen who make knives of a certain black stone or flint, which it is a most wonderful and admirable thing to see them make out of the stone; and the ingenuity which invented this art is much to be praised. They are made and got out of the stone (if one can explain it) in this manner: One of these Indian workmen sits down upon the ground and takes a piece of this black stone, which is like jet, and hard as flint, and is a stone which might be called precious, more beautiful and brilliant than alabaster or jasper, so much so that of it are made tablets and mirrors. The piece they take is about 8 inches long, or rather more, and as thick as one's leg or rather less, and cylindrical. They have a stick as large as the shaft of a lance, and 3 cubits, or rather more, in length, and at the end of it they fasten firmly another piece of wood 8 inches long, to give more weight to this part, then pressing their naked feet together, they hold the stones as with a pair of pincers or the vise of a carpenter's bench. They take the stick (which is cut off smooth at the end) with both hands, and set it well home against the edge of the front of the stone, which also is cut smooth in that part; and then they press it against their breast, and with the force of the pressure there flies off a knife, with its point and edge on each side, as neatly as if one were to make them of a turnip with a sharp knife, or of iron in the fire. Then they sharpen it on a stone, using a hone to give it a very fine edge; and in a very short time these workmen will make more than 20 knives in the aforesaid manner. They come out of the same shape as our barbers' lancets, except that they have a rib up the middle, and have a slight graceful curve toward the point. They will cut and shave the hair the first time they are used, at the first cut nearly as well as a steel razor, but they lose their edge at the second cut; and so to finish shaving one's beard or hair, one after another has to be used; though indeed they are cheap, and spoiling them is of no consequence. Many Spaniards, both regular and secular clergy, have been shaved with them, especially at the beginning of the colonization of these realms, when there was no such abundance as now of the necessary instruments and people who gain their livelihood by practicing this occupation. But I conclude by saying that it is an admirable thing to see them made, and no small argument for the capacity of the men who found out such an invention.

Tylor[2] says:

Hernandez gives a similar account of the process. He compares the wooden instrument used to a crossbow. It was evidently a T-shaped implement, and the workman held the crosspiece with his two hands against his breast, while the end of the straight stick rested on the stone. He furthermore gives a description of the making of the well known maquahuitl, or Aztec war club, which was armed on both sides with a row of obsidian knives, or teeth, stuck into holes with a kind of gum. With this instrument, he says, a man could be cut in half at a blow—an absurd statement which has been repeated by more modern writers.

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[1] Monarquia Indiana, Seville, 1615.

[2] Anahuac, p. 331.

SMITHSONIAN INSTITUTION.
UNITED STATES NATIONAL MUSEUM.

ARROWPOINTS, SPEARHEADS, AND KNIVES OF PREHISTORIC TIMES.

BY

THOMAS WILSON,
Curator, Division of Prehistoric Archæology, U. S. National Museum.

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